THE AMERICAN GAS LIGHT JOURNAL

REDWAY & KENNY, N.Y.

PUBLISHING OFFICE No. 42 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, HEATING, MECHANICAL, CHEMICAL AND GENERAL SCIENCE.

VOLUME LXXX. No. 5. Whole No 1,495. | NEW YORK, MONDAY, FEBRUARY 1, 1904. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager.
THOMAS J. CUNNINGHAM and ELBERT P. CALLENDER, Editors.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND-CLASS MATTER.

CONTENTS.

An Asterisk (*) denotes an illustrated article.

OFFICIAL NOTICES—
Thirty-fourth Annual Meeting, New England Association of Gas Engineers 161

NOTICES—
Eleventh Annual Meeting, Michigan Gas Association 161
Third Annual Meeting, Wisconsin Gas Association 162

OFFICIAL NOTICES—
Premiums Offered, Ohio Gas Light Association 162
Novelty Advertising Department, Ohio Gas Light Association—Nos. I. and II. 162
Wrinkle Department, Ohio Gas Light Association 162

EDITORIALS—
Briefly Told 162
Association "Proceedings"—Notes.
Obituary Note.—Mr Jos B. Crockett 163
Use of Flueless Gas Warming Stoves 163
*The Pilling Air Engine and Hoist 164
Steam Heating from a Central Station 166
*Is Anything the Matter with Piece Work? 167
The True Spirit of Associate Work, by Mr. C. F. Drake 168
Utilization of Sulphur in Gas Works: Old and New Methods 169
Defects of Uncarburetted Water Gas as a Fuel for Laboratory Use ... 170

SPECIAL ENGLISH CORRESPONDENCE 171
A Retrospect—The Willey Commission to America—A Young Gobbler.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES 172
A Budget from "Pacific"—Suit for Infringement—Dearer Gas Williamsburg, Pa.—Receiver for the Lehigh and Northampton (Pa.) Company—Capital Increases Allowed—Something from Jenkintown, Pa.—Selling Gas Ranges in Zero Weather—Annual Meeting, Brattleboro, Vt.—The Chicago Authorities Nonsuited—Mr. C J. R. Humphreys to Act as Expert—Annual Meeting, Cleveland, O.—Capital Increase, New Haven, Conn.—Annual Meeting, Savannah, Ga.—Capital Increase, Providence, R. I.—Output Increases, Cincinnati O.—Personal—Facts from Los Angeles, Cal.—Gas Company for Cleburne, Tex.—Personal—Annual Meeting, Newport, R. I.—Annual Meeting, Houston, Tex.—And Other Items.

The Market for Gas Securities 174

[OFFICIAL NOTICE.]

Thirty-fourth Annual Meeting, New England Association of Gas Engineers.

NEW ENGLAND ASSOCIATION OF GAS ENGINEERS,
OFFICE OF SECRETARY,
EAST BOSTON, MASS., Jan. 28, 1904.

To the Members of the New England Association of Gas Engineers:

The Thirty-fourth annual meeting of this Association will be held at Youngs' Hotel, Boston, Thursday and Friday, February 18th and 19th, 1904.

The following papers and topics will be presented:

"Inclines," by Mr. C. F. Prichard, Lynn, Mass.

"Inclines," by Mr. C. H. Gifford, New Bedford, Mass.

"Testing Water Heaters," by Mr. A. J. Campbell, Norwich, Conn.

"Installation and Maintenance of Gas Arcs," by Mr. T. H. Hintze, Lowell, Mass.

"High Pressure Lines," by Col. F. S. Richardson, North Adams, Mass.

"The Gas Engine from the Manager's Standpoint," by Mr. H. W. True, Boston, Mass.

You are also requested to discuss the following questions:

"What precautions are necessary to prevent firing in gas coal piles?"

"What co-operation or mutual benefit or profit-sharing schemes have been tried by New England Gas Companies? Upon what lines and with what success?"

"Is there any standard size of service pipe?"

"Depth of material in purifiers?"

"The use of gas for cremation?"

"What have been the permanent effects of the coal famine of 1902?"

"How does Texas oil behave in the New England climate?"

"What is the present state of electrolysis? How best handled and stopped?"

"What is the effect of different styles of station meter drums on capacity?"

"Does correction for temperature at station and photometer meters give correct figure of volume at 60°, especially at high temperatures?"

"What is the effect on candle power of compression to say 5 pounds?"

"How many practice preheating the oil in making water gas? Is anything gained by it, except with heavy oils, or even with them?"

"What is best form of tar overflow for hydraulic main?"

"How much sulphur is being furnished New England gas companies in their coal?"

"Are the high pressure systems meeting the expectations of their promoters?"

"How much saving is shown by the new 'rehandling' plants?"

Members are urged to bring with them to the meeting facts and figures bearing on the above, so the discussion thereon may be to the point.

The annual dinner will be at 6:30, Thursday evening. Your attention is called to the Library, which is now ready for your use at 715 Tremont Temple.

It is hoped that enough "Forms" will be received so that a display of them can be made.

If members will remit their dues before the date of meeting, it will be a help to the Secretary.

All friends of the Association are cordially invited to attend the sessions whether they receive a formal invitation or not, and to take part in the discussions.

N. W. GIFFORD, Secretary.

[NOTICE.]

Eleventh Annual Meeting, Michigan Gas Association.

MICHIGAN GAS ASSOCIATION,
OFFICE OF THE SECRETARY,
ANN ARBOR, MICH., Jan. 1, 1904.

The Eleventh Annual Meeting of the Michigan Gas Association will be held in Saginaw, Wednesday and Thursday, the 17th and 18th of February, 1904. The headquarters of the Association will be at the Hotel Vincent. The meeting is to be held in the parlors of the Saginaw Club. The following papers will be read:

"A Few Notes on Ammonia," by Mr. F. E. Sheriff, Battle Creek, Mich.

"The Laying of High and Low Pressure River Gas Lines," by Mr. H. C. Morris, Bay City, Mich.

"The Laying of Mains and Services and Recording of Same," by Mr. John Hellen, Grand Rapids, Mich.

"Care of Benches and Results Therefrom," by Mr. Thos. J. Whalen, Jackson, Mich.

"Advertising: As Advantageous to the Gas Business," by Mr. A. P. Ewing, Detroit, Mich.

"A Report of Progress on the Study of Naphthaline," by Mr. Samuel Ball, University of Michigan, Michigan Gas Association Scholarship.

LIBRARY OF THE MASS. FEB 1 1904 SMITHSONIAN DEPOSIT.

In addition to these papers, the Question Box will be made the feature of one session. Replies to all questions received are now in preparation.

A beefsteak supper will be served the members at the East Saginaw Club, on the evening of February 17th, by the Saginaw Gas Company.

Rates at the Hotel Vincent have been secured as follows:

Room without bath, for one person.....	$2.50	per day.
" " two persons.....	5.00	"
Room with bath, for one person.....	3.00	"
" " two persons.....	6.00	"

The Bancroft House is an equally good hotel, where similar rates can be obtained. Those desiring good accommodations should write in advance.

This meeting promises to be the best in the history of the Association, and every member is urged to be present. Members of other Associations, and gas fraternity in general, are cordially invited to meet with us.

H. W. DOUGLAS, Secretary.

[NOTICE.]

Third Annual Meeting, Wisconsin Gas Association.

WISCONSIN GAS ASSOCIATION,
OFFICE OF THE PRESIDENT,
RACINE, WIS., Jan. 17, 1904.

To the Members of the Wisconsin Gas Association: The Third Annual Meeting of the Wisconsin Gas Association will be held in Milwaukee, Wednesday and Thursday, Feb. 17th and 18th, with headquarters at the Hotel Pfister.

HENRY H. HYDE, President.

[OFFICIAL NOTICE.]

Premiums Offered, Ohio Gas Light Association.

OHIO GAS LIGHT ASSOCIATION,
OFFICE OF SECRETARY, DELAWARE, O.,
January 4, 1904.

It affords me very great pleasure to announce to the gas fraternity that, in connection with the Twentieth Annual Meeting of the Ohio Gas Light Association, which is to be held in Cleveland, March 16th, 17th and 18th, 1904, Mr. John D. McIlhenny, President of the Association, will offer the following premium for the best paper on "The Best Arrangement for Recovering and Utilizing the Waste Heat from Gas Benches."

Abady's "Gas Analyst's Manual."
Byrne's "Highway Construction."
Carpenter's "Heating and Ventilating of Buildings."
Carhart's "High School Physics."
Crooker's "Electric Lighting," 2 Vols. (1, Station; 2, Distribution).
Crafton, "Handbook of Practical Gasfitting."
Groves and Thorpe's "Gas Lighting."
Hughes and Richard's "Gas Works."
Johnson's "Engineering Contracts and Specifications."
Kent's "Mechanical Engineers' Pocketbook."
Patton's "Treatise on Foundations."
"Self-Instruction in Gas Manufacture."
Wagner's "Chemical Technology."
Newbigging's "Handbook for Gas Engineers."

Competition is open to all. A committee will be appointed and announced later to pass on the contributions and the decision of the committee will be made known at the meeting. Those desiring to enter this competition should have their paper in the hands of the Secretary not later than March 1st, 1904.

T. C. JONES, Secretary.

[OFFICIAL NOTICE.]

Novelty Advertising Department, Ohio Gas Light Association.—No. I.

OHIO GAS LIGHT ASSOCIATION,
OFFICE OF SECRETARY, DELAWARE, O.,
December 12, 1903.

The Editor of the Novelty Advertising Department, Mr. B. W. Perkins, of South Bend, Ind., desires to announce that his department is now open for contributions to be presented at the Twentieth Annual Meeting, which will be held in Cleveland, March 16th, 17th and 18th.

This department is one of the most attractive features of the convention. Its success, however, depends largely upon the active co-operation of the members. It is, therefore, earnestly hoped that the fraternity will not be backward in sending advertising schemes to Mr. Perkins.

T. C. JONES, Secretary.

[OFFICIAL NOTICE.]

Novelty Advertising Department, Ohio Gas Light Association.—No. II.

OFFICE OF THE EDITOR,
SOUTH BEND, IND., December 30, 1903.

The Executive Committee of the Ohio Gas Light Association has added to the Novelty Advertising Department a "New Business Methods Department," which, with the former, will combine any and all methods for furthering the business of gas companies. This will include any scheme or method that has been, or is being, used to further the sales or use of gas, coke, tar, gas fixtures, fittings, ranges, heaters, etc.; in short, all residuals and gas consuming appliances, whether for fuel or lighting purposes.

Contributions are requested from all, whether they are members of the Ohio Gas Light Association or not, as the proceedings are published and the use of any method mentioned is for the use of the fraternity at large. Contributions are requested to be sent as early as possible, as their arrangement and printing require considerable time.

Yours truly, B. W. PERKINS, Editor.

[OFFICIAL NOTICE.]

Wrinkle Department, Ohio Gas Light Association.

OHIO GAS LIGHT ASSOCIATION,
OFFICE OF THE SECRETARY, DELAWARE, O.,
December 28, 1903.

The Editor of the Wrinkle Department, Mr. E. E. Eysenbach, St. Paul Gas Light Company, St. Paul, Minn., earnestly solicits the co-operation of the fraternity for contributions to be presented at the Twentieth Annual Meeting of the Association, which is to be held at the Hollenden Hotel, Cleveland, March 16th, 17th and 18th, 1904.

Editor Eysenbach will be pleased to receive contributions not later than February 15th.

T. C. JONES, Secretary.

BRIEFLY TOLD.

ASSOCIATION "PROCEEDINGS."—We are in receipt of a copy of the "Transactions of the Pacific Coast Gas Association, Eleventh Annual Meeting," which record has to do with the proceedings of its last session, held in San Francisco last July. The printing and illustrating are all that could be desired, but the indexing might with greater usefulness have been greatly amplified. It also seems that the life of the volume *per se* would go on to more dignified maturity had it been bound in something more substantial than fairly heavy paper. However, it is likely that those who value such tomes will never mind the cover, especially remembering that bookbinders abound.

A second welcome addition to our collection is a copy of the "Proceedings of the New England Association of Gas Engineers," which narrates the matters transacted at its Thirty-second and Thirty-third Annual Meetings, February 1902 and 1903. The book does its compilers and editors great credit, and its publishers (the New Bedford Printing Company) as well. It is staunchly bound and its indexing leaves nothing to be desired on such account. Another valuable feature of the "Proceedings" is a well arranged list of the papers read before the Association since its formation, and a list of its membership that is certainly complete in every respect. The "Gas Library" of the Association, the real practical starting point of which may be traced to the generous gift of Mr. Frederic Egner, is also noted in concise way, but that conciseness does not conceal the fact that the Library is in much more than the embryonic stage.

The third addition to our records comes in the shape of the "Proceedings of the American Gas Light Association: Thirty-first Annual Meeting," held in Detroit last October, under the Presidency of Mr. Alten S. Miller. The book differs in no vital or important respect from those that immediately preceeded it, which is equal to the statement that it is quite up-to-time. As it bears the imprint of Charles P. Bloom, Publisher, New York city, that branding is also a guarantee that from a printer's standpoint everything as to cover and leaves are fit. These books are reviewed according to the order in which they were received.

NOTES——

AT the annual meeting of the Doylestown (Pa.) Gas Company the Directors elected were: Henry Lear, Wm. H. Kirk, J. F. Hendricks, Jno. Yardley, H. B. Eastman, F. Worthington and C. F. Mayers.

Is Mr. John W. Golden, of Savannah, Ga., married? Many of his friends in the East, including a gentleman well-known in court circles in New York county, would like to know.

[Prepared for the JOURNAL.]

Obituary Note.—Mr. Joseph B. Crockett.

By PACIFIC.

Mr. Joseph B. Crockett, whose death was briefly alluded to in your issue of the 11th of January, was identified with gas interests from his first step in business life, until the severance of his official ties with the San Francisco Gas and Electric Company, the 12th of December, 1901, on account of failing health.

Mr. Crockett was born in St. Louis, Mo., the 12th of November, 1850, and was named for his father, Joseph Bryant Crockett, who, with his family, had then lately moved from the old home in Hopkinsville, Ky.; and in 1852, Mr. Crockett, Senior, attracted by the bright prospects of the far West, came to California where he was long a prominent member of the Bar, and later a Justice of the Supreme Court of the State, and where the subject of our sketch received his early education, which was completed at Kenyon College, Gambier, O. On Mr. Crockett's return to California from Kenyon, at the age of 19, he entered on his career in the gas business in San Francisco, as Engineer's Clerk for the City Gas Company, a Company just then formed by Messrs. J. B. Haggin, Lloyd Tevis and other San Francisco capitalists in opposition to the San Francisco Gas Company, the first established on the Pacific Coast, and remained with the City Gas Company from the excavations for the foundations until the completion of its entire plant at a point in the city known as the "Potrero," and until its consolidation with the San Francisco Gas Company, under the name of the San Francisco Gas Light Company, June, 1873, remaining in the same capacity with the Consolidated Company until 1875, when he was appointed Assistant Engineer, under Mr. Wm. Beggs, Engineer. In January, 1876, Mr. Crockett was made Engineer-in-Chief, which position he held, until January, 1885, when he became President of the Company, and so continued until and after the consolidation of the San Francisco Gas Light Company with the Edison Light and Power Company, under the name of the San Francisco Gas and Electric Company. He was annually, for 17 years, re-elected President until his resignation, on the 12th of December, 1901, which became effective January 15, 1902.

Mr. Crockett died on the 24th of December, 1903, at the early age of 53 years, having devoted his entire business life to the gas industry.

When he became Engineer of the San Francisco Gas Light Company he was confronted with new problems in the manufacturing of gas, but, with the energy and hopefulness of youth, he was not in the least daunted, and without hesitation proceeded to adopt new methods. Notwithstanding these adverse conditions, he rebuiit and enlarged the works of the former City Gas Company at the Potrero, adding to its coal gas a water gas plant, an innovation which subsequent events proved his wisdom and good judgment. He frequently visited the Eastern States, and twice went to Europe in order to keep himself thoroughly in touch with the advances being made in the effective and economical manufacture of gas; and thus, by close observation, study and original investigation, became thoroughly conversant with every detail of the business.

Foreseeing the growth of the city of San Feancisco, he, after some difficulty, succeeded, in the year 1886, in convincing his rather conservative Board of Directors of the necessity of making provision for the erection of another plant at a point on the opposite side of the city to the location of the then existing works, in order to be in a position, in the event of accident or disaster to either one of the works, to be able to supply the people with illuminant from the other without interruption or inconvenience. His views being finally approved, he succeeded in securing six blocks of land, on the bay, at the north of the city, for a price which to-day could not acquire a fraction of one of the blocks, and which at to-day's values would make the purchase of that land for the purpose prohibitive, and immediately proceeded with the construction of what is known as the "North Beach Station," which was pronouneed by all the prominent engineers who visited it to be the best equipped, concentrated, neatest and most presentable gas works then in action. This was also a coal gas and water gas plant, each department separate and in duplicate, so that in case of accident the duplicate plant could be immediately fired, or the entire works put in commission at once.

It was a matter of pardonable pride with Mr. Crockett that the construction of the North Beach Station was paid for entirely from the surplus earnings of the Company and without the suspension of a single dividend to the stockholders.

Mr. Crockett was one of the founders, and first President, of the Pacific Coast Gas Association and contributed greatly to its successful existence. He was a member of various Gas Associations in the chief cities of the United States, and at one time was President of the American Gas Light Association.

Mr. Crockett was universally liked for his cheerfulness, good nature and readiness to assist in any undertaking to create and maintain the friendly feelings of all on the Pacific Coast connected with the gas industries.

He was identified with all the prominent clubs in San Francisco, and was ever a welcome and popular member. In the years 1895–1896 he was President of the Pacific Union Club. He was a member of the Bohemian Club, of the Burlingame County Club, and at one time its President, was one of the original members of the University Club, of San Francisco, and was also a member of the Technical Society of the Pacific Coast. From 1887 to 1890 he was Vice-President of the San Francisco Art Association.

A wife and daughter survive him, and countless friends mourn his untimely taking off.

Use of Flueless Gas Warming Stoves.

In an article communicated by H. Leceister Greville, F.I.C., F.C.S., to the *Journal of Gas Lighting*, the author commences his remarks by noting that the recent investigations of Dr. Thorpe, and subsequent comments thereon, have naturally directed attention to what is now practically an old subject. One rightly calls attention to the limited nature of the investigation—viz., the search for what may be termed limited combustion products, such as carbon monoxide and acetylene, ignoring sulphur products and the question of humidity, one might add also carbon dioxide. It is obvious that any consideration of the results of discharging the whole of the combustion products from any fuel used for heating purposes into an inhabitated room must embrace a complete investigation of the whole subject to be of material use, and should not be limited in its character. It is singular that so eminent a chemical expert as Dr. Thorpe, experimenting on such an important subject, should not have investigated the whole matter more completely. Perhaps his instructions did not permit of such a wide scope of operation.

There is no reason to suppose that the products of the combustion of gas by burners, either of a luminous or of a non-luminous character, should differ when burnt in the comparatively open atmosphere of an ordinary room, or within the comparatively limited area of a gas stove, if supplied with a sufficient quantity of air to insure complete combustion. With regard to the evidence of such products of incomplete combustion as carbon monoxide and acetylene from ordinary gas burners, we have reliable figures and evidence of many years' standing. A valuable article on the subject appeared in the *Journal* for November 19, 1895, by Mr. Lewis T. Wright. In this, allusion is made to German investigations, in which it is concluded that the use of Welsbach, Argand, and flat flame burners is unattended with danger of poisoning by carbonic oxide. Further experiments by Mr. W. Thomson (in a paper read before the British Association in 1890) are also quoted. In this case, the conclusion arrived at was that "the gases escaping unconsumed" from the various burners, both lighting and heating, would indicate that combustion was not, in the cases under investigation, so complete as might be desired.

Mr. Wright, in criticizing the conclusions arrived at, points out that the method of investigations was not above suspicion of fallacious results. Mr. Thomson relied on the development of carbon dioxide by passing through heated copper oxide of the products of combustion, after all the carbon dioxide and water vapor had been previously removed. Mr. Wright points out that, in the absence of blank experiments on the surrounding atmosphere, which might contain naturally existing organic impurities, or even contamination from a leaky gas connection, the results could not be regarded as being altogether reliable. Somewhat later, an inquiry was carried out in the "Lancet" laboratory, under the most stringent conditions, with regard to the nature of the combustion products from Welsbach, Argand, and Bray burners, with entirely negative results as to the presence of carbon monoxide or acetylene.

Mr. Wright subsequently made experiments on the same subject. In his case, the combustiou products from various burners were tested under regulated conditions. The gas was burned in small apartments, the atmosphere of which was specially tested as to its freedom from unconsumed coal gas. The combustion products were drawn from tubes placed over the respective flames, and were passed through cotton wool, to remove dust, organic matter, etc., and then through soda lime to absorb carbonic acid. The subsequent gas, passed through specially prepared pure heated copper oxide, failed to develop the slightest trace

of carbonic acid, proving unmistakably the absence of carbonic oxide or unconsumed coal gas. There is no doubt that in all experiments on this subject a blank experiment on the purity of the surrounding air should be made; and though this precaution was not adopted in Dr. Thorpe's experiments, the general results with regard to the possibility of the existence of incomplete combustion products from efficiently burnt gas and oil, they must be regarded as eminently satisfactory.

With regard to the question of sulphur compounds, I do not happen to remember any published statistics; but I investigated the subject partially many years ago when the so called "Siphon stoves" first came into existence; and the results may be of interest as helping to fill up the missing link in Dr. Thorpe's experiments. I find on reference to my notes that the main object of my investigation was as to the extent to which this form of stove reduced the proportion of the sulphur products arising from the combustion of the gas. I find also that, incidentally, some temperature determinations were made, and in one case an analysis of the escaping gases from the stove, but with no object of specially searching for such compounds as carbon monoxide or acetylene. Some twenty years ago (the date of my researches), I seem to have considered such a refinement unnecessary, or rather that such incomplete combustion products were quite unlikely to exist under the circumstances. Subsequent evidence seems to have justified my conclusions.

The stove was of the now well known character—a vertical central tube in which the gas was consumed in an Argand burner: the combustion products passing subsequently through two vertical side tubes, and thence into the air. A tray beneath received the condensed combustion products.

The following table gives the details of the tests:

Consumption of Gas per Hour. Cubic Feet.	Total Sulphur in Gas. Grains per 100 Cubic Feet.	Sulphur Removed by Stove.	Percentage of Sulphur Removed by Stove.
5.0	17.8	10.5	59.0
5.0	10.2	6.2	60.0
5.4	9.6	6.1	63.5
6.0	9.5	6.1	64.2
7.6	9.2	5.9	64.1
9.0	10.9	6.0	55.0
Mean percentage of sulphur separated by stove			60.9

It might have been expected that some explanation of the causes of varying efficiency might have been traced; but it is difficult to form any conclusion, either derived from different rates of combustion or from varying proportions of sulphur in the gas. A special series of experiments as to the temperature of the combustion products leaving the apparatus gave the following results. The temperature of the atmosphere was not recorded; but the weather was cold, and no other stove was in the room.

Consumption of Gas. Cubic Feet per Hour.	Temperature Outlet of Central Tube, Degrees F.	Temperature Outlet of Side Tube, Degrees F.
5	150	106
6	160	112
7	182	123
8	190	127
9	202	131
10	214	135

Some further experiments were made on a larger form of stove of the same type, with the exception that the combustion products passed to the closed top of a comparatively high metallic column, and then downward between this and an external radiating column, from the upper outlet of which they escaped.

Gas. Cubic Feet Per Hour.	Sulphur in Gas. Grains per 100 Cubic Feet.	Sulphur Separated by Stove.	Percentage of Gas Separated by Stove.
4 to 6	9.6	8.5	88.5
	8.2	6.5	80.0
	9.2	7.2	78.2
	8.5	8.0	94.1
8.5	10.5	7.5	71.4
9.3	10.1	6.2	61.3
Mean percentage of sulphur separated by stove			78.9

A further series of experiments made on gas containing a higher proportion of sulphur gave:

7.5	19.5	16.9	86.6
6.5	20.0	18.3	90.1
7.0	19.0	15.5	81.5
8.4	106.0	81.3	76.8
Mean percentage of sulphur separated by stove			83.7

With the gas burning at the rate of 8 cubic feet per hour, the composition of the combustion products (by volume) was as follows:

Nitrogen	78.68
Oxygen	16.46
Carbon dioxide	1.74
Water vapor	3.12
Sulphurous acid	Trace

The action of this class of stove in separating such a large proportion of sulphur from what would naturally exist in the normal combustion products is certainly remarkable. The condensed liquid—of course, water arising from the combustion of the hydrogen and hydrocarbons in the gas—was always acid, and contained a large proportion of ferrous sulphate arising from the action of the sulphurous combustion products on the metallic iron of the condensing tubes of the stove. The peculiar feature is that so much of the sulphur dioxide normally present as a combustion product passed into sulphuric acid. No doubt the presence of moisture and heat came largely into play; but what part did the metallic iron play take in the reaction? A similar result takes place where copper tubes are employed; and I have read of a case where the life of the apparatus was comparatively brief, and solid copper sulphate was discovered on a dissection.

What results would be obtained *quo ad* sulphur where the combustion products were cooled by a non metallic surface? This question has to be answered. Taking present statistics with regard to the completeness of the combustion of gas burnt in the ordinary way, and the possible elimination of the major quantity of the sulphur by the condensing forms of stove at present in use, there does not seem any material objection to their employment in an ordinary well ventilated apartment. They must render the air of the room moister by reason of the combustion products constantly escaping saturated with aqueous vapor at a comparatively high temperature. At the same time, is it wise to constantly vitiate the air of a room with carbonic acid? It is surely wiser and more sanitary to provide an exit for it into the open air. This consideration must not be forgotten—in fact, it should be emphasized.

The great attraction of one of this class of stoves in a room is the utilization of the whole of the heat to be obtained from the combustion of the gas; and the argument is used that if no harm ensues from having two or three burners for lighting purposes, what prejudicial effect can possibly ensue from consuming the same quantity of gas in a flueless stove. The only answer is the possible danger of the undue contamination of the air of the room from the escape of partially cooled combustion products at a comparatively low level in which they must rise with and diffuse into the surrounding air. Where gas is used for illumination, the conditions are different; and the highly heated combustion products no doubt escape without any material effect on the atmosphere of the room, except the beneficent one of promoting ventilation.

The Pilling Air Engine and Hoist.[1]

It is a recognized fact that in a large share of the machinery constructed for driving by compressed air economy in air consumption is not accorded the degree of attention which it is safe to say is given to the design and operation of steam driven machinery, even of the smaller types. Purchasers and users of steam machinery have long since been educated to the matter of economy, and new equipment installed by them must fulfill reasonable requirements along this line, consistently with the size, type and importance of the apparatus itself.

That a volume of compressed air whose presence in the receiver represents the expenditure of a dollar in steam power is itself worth a dollar, and is worthy of correspondingly careful and economical use should be recognized, and we believe is coming to be more and more so recognized. Various types of air motors for a long time on the market have been mechanically quite efficient, but decidedly wasteful of air; more recent developments by various designers have shown intelligent and careful study of the point of economy in operation, and these designers are setting a pace which others will presumably soon be required to follow.

We illustrate at this time an air engine built essentially along the lines of the familiar oscillating steam engine, whose economy of steam, while not equal to that of more elaborate machinery, is yet in advance of that shown by the more common types of air using appliances. The Pilling air engine is adaptable to a large variety of general uses. In Fig. 1 it is shown forming an essential part of a hoist to be hung from a stationary support or from a movable one, such as a crane jib or a traveling trolley or crane bridge. For more general use the engine may

1. *Iron Age.*

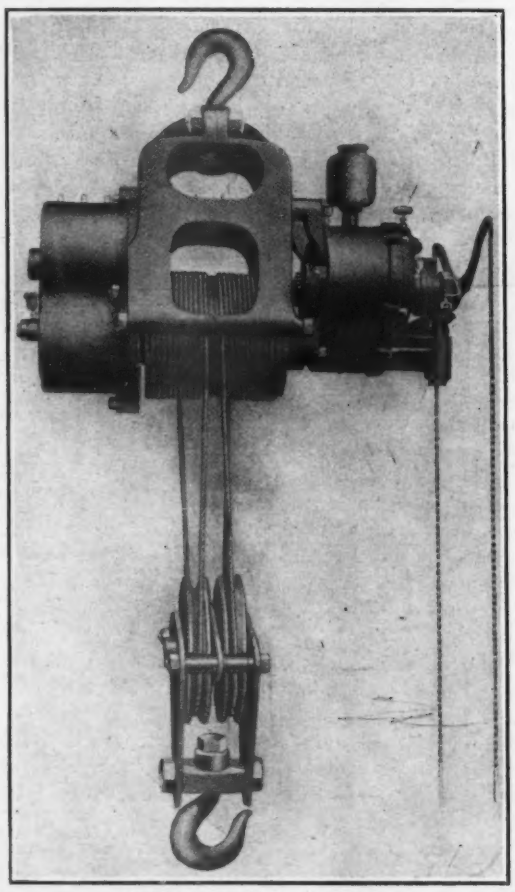


Fig. 1.—Air Hoist Complete.

be geared to drive the mechanism of jib cranes of the ordinary type, to actuate various sorts of hoisting and hauling devices, to rack trolleys carrying hoists, and to supply power for numerous other general and special purposes. As already indicated, the engine is of the oscillating type, and consists essentially of two cylinders placed 90° from each other, their pistons attached to rods connecting them with a single crank pin. In Fig. 2 is shown a section through one cylinder, illustrating the

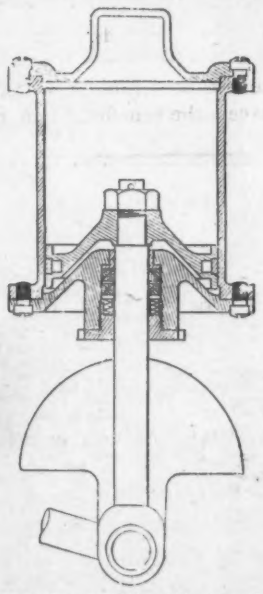


Fig. 2.—Section Through One Cylinder of Engine: Showing Conical Piston.

construction of this feature and its appurtenances. The piston is conical in form, this shape allowing the use of a very deep stuffing box without material increase of the distance between the cylinder and the crank. Compactness is thus maintained, while still permitting the long stuffing box bearing on the rod, so necessary in engines of the oscillating type. Interior form of the cylinder heads is kept in close conformity to that of the piston, so as to reduce clearance to a minimum. The piston packing rings are made in 3 segments each, with 2 springs under each segment. The stuffing box packing is metallic.

Fig. 5 shows the engine case opened, revealing the cylinders, rods and cranks, and showing also the porting of the cylinder faces and of the corresponding disks on the cover plate. The operating lever, to the ends of which hand chains are shown attached in Fig. 1, is of the rotary type, similar to a Corliss valve. The valve admits air into one or the other of two chambers in the cover plate, according as one or the other hand chain is pulled downward, the other chamber becoming for the time being the exhaust chest. The direction of movement of the engine is thus controlled directly by the hand chains. Exhaust air is allowed to escape into the engine case, its low temperature there serving to keep the parts cool and to chill the oil so that it will adhere to the rubbing surfaces. Port areas are large relatively to the size of the cylinders and the speed of the pistons. Careful balancing of the reciprocating parts is effected by counterweighing the crank disk after the manner shown in Figs. 2 and 5.

For general uses the crankshaft is extended through the rear of the case and fitted there with a pinion, beyond which is a rigid bracket bearing support, as in Fig. 3. This engraving also shows the external

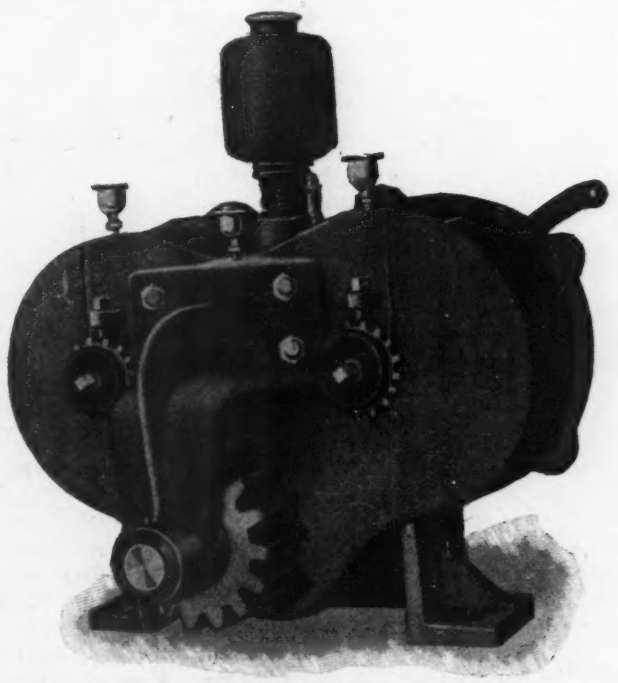


Fig. 3.—Rear View of Engine, Showing Driving Pinion and Exterior Adjustment of Ports.

adjustment for the pressure between the valve seat disks. The set screws pass through lugs cast upon the case and their points engage the teeth of adjusting nuts which control the compression of helical springs for maintaining the pressure of contact between the cylinder port disk and the admission and exhaust disk. The construction is evident from Fig. 4.

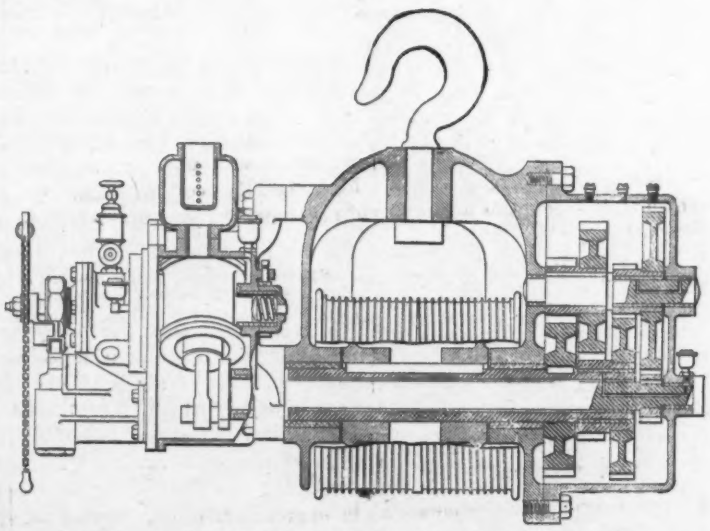


Fig. 4.—Elevation of Hoist, Partially in Section, Showing Drum Gearing.

The use of the engine as motive power for the hoist of Fig. 1 is illustrated in detail by Fig. 4, which presents an elevation of the device, partially in section. Here the engine is at the left. Directly below the operating lever is a plunger which is pressed upward by a spring and tends to hold the lever in the middle or closed position. The air supply

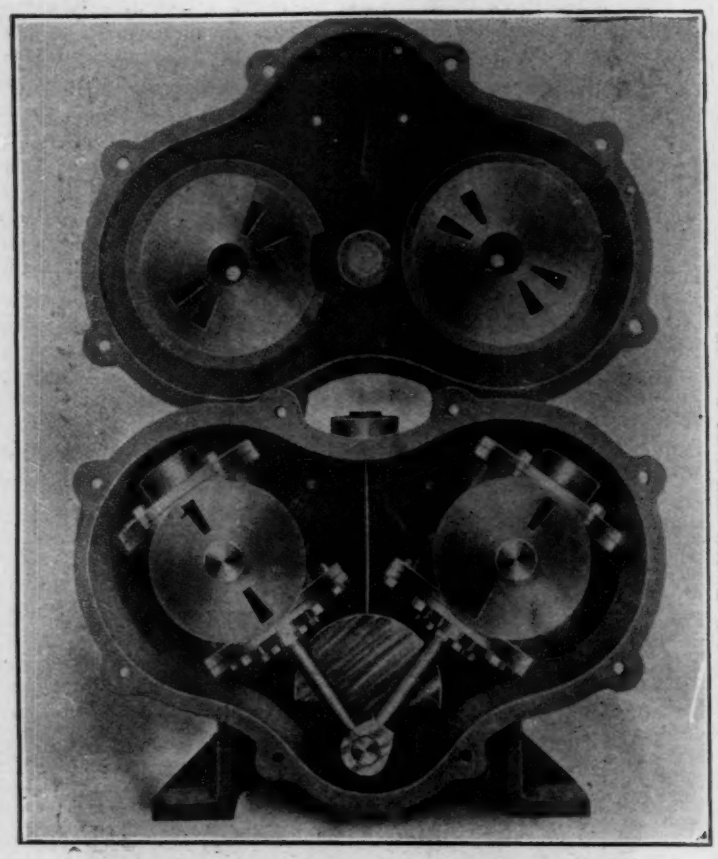


Fig. 5.—The Engine Opened, Showing Arrangement of Cylinders and Ports.

pipe is attached at the hole below the oil cups at the left of the crank case. At top of the case is the exhaust head, whence the used air passes out from the case into which it flows from the cylinders, as already stated. The crankshaft passes through the cable drum quill to the extreme right hand side of the gear housing, where it is fitted with a pinion meshing with a gear keyed to a sleeve turning loosely upon a short shaft, which itself rotates in bearings in the gear housing. The pinion also attached to this sleeve drives a gear fitted beside another pinion on a sleeve turning upon one end of the drum quill. This pinion in turn drives a gear keyed to the upper short shaft, whence the drum quill and the drum itself are driven through a fourth pinion and gear. Thus the drum speed is greatly reduced below that of the crankshaft by the quadruple gear train. The drum quill turns in bearings in the main housing, between which bearings the hubs of the drum are keyed to it. The crankshaft is supported in one bearing at the engine case and in another at the gear housing, passing through the drum quill without touching it and without support from it.

The hoisting drum is spirally grooved from each end toward the center. The machine is, therefore, balanced at all times, with or without load, and riding of the hoisting rope is practically impossible. The length and diameter of the drums are proportioned so as to allow the use of from 80 to 100 feet of rope, thus providing for from 18 to nearly 25 feet of clear lift. High speed is possible with these engines. These speeds, for 75 pounds per square inch working air pressure, are 700, 950 and 1,200 revolutions per minute for the three sizes of engine, whose cylinder dimensions are, respectively, 4½ by 4 inches, 3½ by 3½ and 3 by 3 inches.

On account of this high speed, it is claimed that the consumption of air varies with the load, thus placing this machine in a position of superiority to others wherein the same quantity of air is used when the hook is hoisted empty or is lowered as when full load is being lifted. A triple increase of speed is claimed for these engines and hoists, a lifting speed of 21 feet per minute being accomplished as against 7 feet per minute, stated as being about the maximum attained by certain other hoists. While 21 feet per minute is approximately the hoisting speed, loads may be lifted as slowly as desired, and at any intermediate speed up to the maximum. With air pressures greater than 75 pounds higher speeds are, of course, possible. It is stated that the Pilling engine may be stalled by a load beyond its capacity, but that, owing to its mechanical excellence of construction, it cannot be thrown out of line, and that it cannot be broken, since it will not allow itself to be loaded beyond its ultimate capacity.

The gear case, engine box and cover are of cast iron; the main housing is of cast steel; all gears are cut from forged steel; the shafts are of steel; all bearings are bushed with bell metal. The valve seats are also of bell metal, and are removable. Hs is evident from the several illustrations, and especially from Fig. 4, careful attention has been given to efficient lubrication, and oiling devices are provided for all rubbing surfaces. The makers of the engine and of its various adaptations, as previously enumerated, are the Pilling Engine Works, Bucyrus, O.

Steam Heating from a Central Station.

In a paper on this subject, read before the Indiana Engineering Society's last annual meeting (Indianapolis, January 15th) the author, who is connected with the Merchants Heat and Light Company, of Indianapolis, said: Central station heating is the result of several conditions: (1) The demand of the public, following (particularly in this State) failure of the natural gas, the uncertainty of the coal supply, and the complaint against the smoke nuisance; (2) probably the more important cause is the endeavor of the manager of the local electric light and power company to increase the earning power of his plant, and to get some revenue out of what might be called waste energy; namely, exhaust steam.

Central station heating may be divided into two classes: Hot water and steam. Steam heating may then be divided into (1) the straight heating plant (both high and low pressure); (2) the low pressure or exhaust steam plant. This latter class may again be divided: (A) the return, or where the condensation is returned to the power house, and (B) the 1-pipe system, where the condensation, after being cooled, is discharged into the sewer and is a loss. This paper will be confined to the latter class, and more particularly to the plant of the Merchants Heat and Light Company, of Indianapolis, together with its operation.

Simultaneously with the failure of natural gas, the uncertainty of the coal supply, together with smoke and the inconvenience of the individual plant, and a demand for cheaper electric light, a movement was set on foot by the Merchants' Association of Indianapolis, looking to the overcoming of these and many other difficulties, and the logical solution was central station heating. Mr. W. H. Schott, who later designed and installed the plant, was called in, and plans and estimates were furnished. A franchise covering the business section of the city for steam heating and electric light was secured July 29, 1902, and by the following January steam was being carried through a long system of mains and several buildings were being heated. Up to the present day, practically one year, the plant has given entire satisfaction, which is confirmed by the fact that about 125 of the largest business buildings, with a total of nearly 200,000 square feet of steam radiation, are being supplied by exhaust steam.

The plant was designed to run condensing or straight electric during summer months, and with a back pressure of from 1 to 7 pounds during the heating season. The capacity of the power house at present is but one-third of its ultimate size. It is equipped with seven 250-horse power Wickes water tube boilers, with Roney stokers designed for the burning of slack coal. There are three 500-horse power and one 350-horse power Ideal compound engines, designed to run condensing on 18 pounds of steam per horse power per hour, and 27 pounds of steam when running with a back pressure of 5 pounds. The engines are direct connected with three 350 kw. and one 250 kw. Western Electric direct current 250-volt generators. There are also two 1,000-ampere compensators, one 2,000-horse power Cochrane-Sorge heater and purifier, and one 2,000-horse power Worthington jet condenser and cooling tower complete. A 20-inch Davis back pressure valve is installed on the open air exhaust. There is also a 10-inch live steam line connected to the heating main through an automatic reducing valve to furnish live steam if there should be an insufficient exhaust to maintain the required heating line pressure.

The system of street mains was laid out to supply 500,000 square feet of radiation with a power house pressure of 5 pounds, and at present there is installed 16,885 feet of 8 to 20-inch mains. The greatest distance this exhaust steam is carried is 4,840 feet, and at this point there is a building requiring 7,500 square feet of radiation. The most of the underground insulation was special design and built up of 2-inch hemlock lumber, set staggered, with two dead air cells between the layers of lumber, filled with a special hair felt. The space between the pipe and the insulation is filled with soft wood shavings, and the whole covered with a moisture proof asbestos paper. The line loss due to

radiation with this insulation is almost negligible. Expansion joints are placed about 150 feet apart in manholes, the pipe resting on rollers, giving free travel. Services are taken off from up-turn tees and given considerable swing to allow slight travel of the main. Service connections are not made within 30 feet of an expansion joint. Anchors are placed about midway between expansion joints, thus giving a maximum travel of any service connection of about 0.6 inch. Line condensation is collected at the low points and discharged through traps into dry wells.

Connection to the building is made to a suitable point in the consumer's system. A trap set on the return and condensation sent through what is called a cooling coil, which is water radiation set to heat the basement, or boxed up and used as indirect radiation on the first floor through a floor register. From the cooling coil or water radiation the water is discharged into the sewer at about 150°. In many instances this condensation is used to heat water for domestic purposes, by means of a range boiler.

Probably the most important feature of the entire system, from a satisfactory and economical operating standpoint, is the automatic temperature regulation for buildings. Its value as a steam saver can be placed at 40 per cent., while its value, considering the even temperature, can hardly be estimated. Without temperature regulation, central station heating would not be the success it is to-day. Regulation on this system is obtained by means of thermostatic control of a regulating valve on the steam supply. This is operated by compressed air from the power house of 15 pounds pressure. The valve is sneak feed and gives a regulation not varying over 2°. A small valved by-pass is connected around the regulator and the valve slightly cracked. This keeps the main warm during such time as the regulator is entirely closed for a considerable period, and prevents the regulator opening into a cold main, keeps the air out of the main and gives a more rapid circulation of steam.

Since it is exhaust steam that is used we will consider the heating as a by-product of the electric light plant. To do this we must charge up to lighting only that portion of the operating expenses required under the best operating conditions, *i. e.*, running condensing, and charge against the heating the increase. To do this, we will have to assume average conditions and use the same conditions under each of the two cases. Get the operating costs of each, leaving out the factors that remain constant.

Assume an electric load of 750 kw. as average for 24 hours, and consider the plant first, as a straight electric light plant. As above mentioned, the engines are to run on 18 pounds of steam per horse power hour. This will make a total of 432,000 pounds of steam during the 24 hours. The running of the condenser pumps consumes, say, 40-horse power at 80 pounds of steam per horse power hour, making a total of 67,200 pounds. The running of the cooling tower fan, say, 20-horse power electric motor, would take in steam value about 21 pounds per horse power hour, a total of 10,080 pounds of steam. The boiler feed pumps will average about 15-horse power at 80 pounds of steam per horse power hour, a total of 28,800 pounds. Thus we have an approximate value for steam consumption for 24 hours running as condensing plant, 538,080 pounds of steam.

Now let us change the condition to heating. The average outside temperature for the city of Indianapolis for the 7 heating months is 29°. With this outside temperature, and 200,000 square feet of radiation connected, the power house pressure required will be 3½ pounds. This would mean a back pressure on the engines of 3½ pounds, and the steam consumption wonld increase from 18 pounds to 26 pounds per horse power hour. Going back to our electric load of 750 kw. under these conditions, we will have an engine consumption for the 24 hours of 624,000 pounds of steam. The boiler feed pumps will increase, to, say, 20-horse power, a total of 33,600 pounds. The deep well pump will increase, due to the loss of condensation, about 5-horse power. This is driven by electric motor, and placing its steam value at 21 pounds per horse power hour, it will require 2,520 pounds of steam. Adding this up we will get a total of 660,120 pounds of steam. This will, together with its condensation, take care of 183,000 square feet of radiation. Since we are figuring on 200,000 square feet, there will be live steam required for 17,000 square feet, or about 69,600 pounds of live steam. We thus have a total steam consumption, when operating heating and lighting, of 729,720 pounds of steam.

There are other conditions entering, which must be balanced in heat units. For example, when operating under heating conditions, the boiler feed must be heated from the well temperature to 210°. The raising in temperature of 729,720 pounds of water from say 50° to 210° will require about 117,155,200 heat units. To balance this feed water heating charge, we will charge against the electric light plant the heat units required to raise the water from a hot well temperature of 90° to 210°. This would be 538,080 pounds of water, 120°, or 64,569,600 B.T.U., or difference to be charged against the heating department of 52,585,600 B.T.U. Reducing this to steam at 150 pounds pressure (since no deduction was made from the steam available for heating), and charging it against the heating department, we have 40,000 pounds of steam.

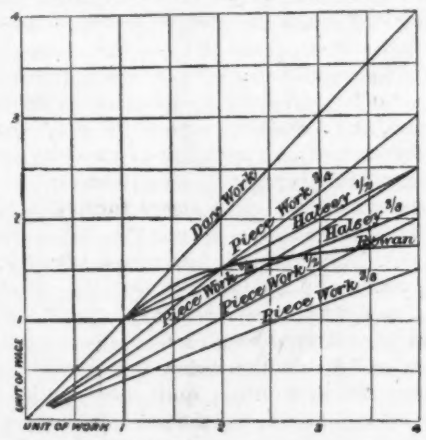
From the above figures we get, from the condition assumed, a total steam consumption, when running as a straight electric plant, 538,080 pounds of steam, and a total consumption of steam when running as both electric and heating, of 729,720, plus 40,000, equal to 769,720, or a difference in steam consumption of 271,640 pounds of steam for the 24 hours. This amount, which is about one-third of the total steam consumption, together with the additional labor, represents the cost of operation, treating the heating as a by-product of the electric light plant.

Is Anything the Matter with Piece Work?

[A paper read by Mr. Frank Richards, before the last meeting of the Am. Soc. Mechanical Engineers.]

1. The title of this paper, if perhaps slangy in form, is not so in fact, and is, I think, fairly characteristic of what follows. It may be frankly stated that the purpose is not so much to convey information as it is to provoke discussion and to accumulate knowledge upon one of the unsettled and one of the most important questions which can engage the attention of this Society. It is also one which can most affect the interests of its members and of those most interested with them in the safe and successful conduct of business. A perfunctory "sitting down" upon the paper is not all that anyone could properly desire, and cannot possibly close the case.

2. Attention is invited to the accompanying diagram, which is easily



understood. The purpose of it is to show the actual earnings of the workman and, of course, also the labor cost to the employer, for any given amount of work done under either day work or piece work at different rates, the Rowan premium system, and Mr. Halsey's premium plan. The amount of work done is represented by the lengths of the horizontal lines, and the wages paid are represented by the vertical lines.

3. As the Rowan system is not in use in this country, all may not understand its basis of computation. It starts with a fair day's work, although that may not be the term used to designate it. The unit assumed is the amount or quantity of work which the man should ordinarily be expected to do in a day for the ordinary day's wage without any special inducement. The premium is earned only by the work which is done in excess of the regular day's work, and the premium earned is according to the time saved in doing the work. If double the work is done in the given time, then one-half the time is saved and the man is paid one-half in addition to his regular wages. If the man does one and a-half times his day's work, then one-third of the time is saved, and he is paid one-third more than his day's wages, and so on. The basis of computation is thus fixed and cannot be juggled with, but the inducement constantly decreases with the amount of work done, so that whatever a man may do, he can never by any possibility double his earnings. Mr. Halsey's premium plan, of course, requires no explanation here, and it will be designated hereafter as *the* premium plan.

4. Referring to the diagram, it will be seen that both day work and piece work, whatever the rate of the latter, are represented throughout

by straight lines. A discouragement curve represents the Rowan premium system and Mr. Halsey's premium plan has a bend sinister. It was impossible to include Mr. Gantt's bonus system in the diagram because a part of it, the part where you do not quite earn the bonus, must be represented by an invisible line.

5. It cannot fail to strike the observer at once that in the premium plan the work which is done in the earning of the premium is straight, absolute piece work. The name cannot disguise it. The line in the diagram for the premium plan at one-half is exactly parallel to the half rate piece work line; the wages earned rise equally in each with equal increments of work done. So the three-eighth premium rate is parallel to the three-eighth piece work rate, and so on. If, in making the premium plan bargain, the proposition were made to the man to first do his allotted quota and be credited with his day's wages, and that then he should go to work by the piece for the remainder of the day at one-half the day rate, that would be the premium plan in every particular.

6. The partial piece work character of the premium plan being undeniable, a paper whose topic is piece work must claim the right to handle it freely and without apology. The premium plan was invented by its originator 19 years ago; it was put in operation in the shop at Sherbrooke, Can., 13 years ago, and was first brought to the notice of this Society in a paper 12 years ago. The plan, I know, has been proposed and advocated in all honesty of purpose; it has been pushed with earnestness and persistency. As a result, the premium plan is in operation in a few machine shops, and nowhere else. I venture the personal opinion, based on the fullest available information, that perhaps 2 per cent. of the machine work in the United States is done under the premium plan, while 10 times as much is done by undisguised piece work, and much more than half is still done by the day.

7. It is not at all apparent that there are any peculiar conditions in the machine shop which demand any different plans of wage adjustment than are prevalent in other trades. While a knowledge of the premium plan is now widespread, the plan has not made itself appear so good a thing that any of the other trades have taken it up. It would not work with the shoemakers of Lynn, the hatters of Danbury, the glovemakers of Gloversville, or the stitchers and starchers in the collar shops of Troy, for they all work by the piece, as do most of the manufacturing trades, and the ultimate possibilities of economical production are thereby secured as completely as they can ever be claimed to be under the premium plan.

8. We might by an effort imagine the effect of proposing the premium plan to one of the trades outside the machine shop. Let it be tried on a lot of bricklayers. Say that it is first agreed that the day's wages are earned when 500 bricks are laid, and that the premium plan begins right there. The bald proposition is, first, that if 500 bricks are laid, 500 bricks will be paid for. This is so far meant to be an honest bargain on both sides. If you do not lay another brick above the 500, we will have no cause of complaint. Well, now, having agreed to pay for the laying of the 500 bricks, when the 500 bricks are laid, go on and lay as many more as you can. If you lay 750 bricks, we will pay you for laying 625 bricks; if you lay 1,000 bricks, we will pay you for laying 750 bricks, and so on. It will be very plain that under this arrangement the workmen are clearly the gainers, for if you lay more bricks, you get some more money, and every additional cent you get is, of course, clear gain to you. The absurdity of this thing, when dealing with bricklayers, is sufficiently evident. Are machinists so vastly different from bricklayers?

9. They must be different, or else there are some things about the premium plan upon which I need information, and I take this way to get it. One of the inherent and inseparable conditions of the scheme would seem to be the voluntary acceptance of it by the individual workman. It depends entirely upon himself how much the man shall do after the allotted amount for the day's work is done. He may do much or he may do little, and therefore, if he so chooses, he may do none at all, but just be content to work along at his usual rate and just earn his day's wages. The premium plan as I understand it is, ostensibly, entirely a coaxing and not at all a driving plan; and yet it is a matter of common knowledge that in the State of New York alone there have been two determined strikes against the premium plan in the past year. This seems odd. If you do not choose to do what you are formally and distinctly allowed to choose whether you will do or not, what possibility for a strike can there be in that? Can it be that premium plan enthusiasts sometimes venture to put on to the plan some features which do not belong to it? I cannot imagine any other way in which a strike could be possible.

10. If they can tag things on and objectionably modify the premium plan, they can also knock things off. The one essential safeguard of the premium plan, continually insisted upon, is that there shall be no cutting of rates when once established. This must inevitably involve injustice, because prices both of labor and of finished products change continually, and there must be, if justice is to prevail, sometimes a cutting of rates, and sometimes an advance of rates. So far as it is possible to fix honest prices, and to maintain them there as long as it is just to both sides to do so, it can be done as well with straight piece work as with any premium plan, and is so done. For instance, I have knowledge of an establishment in the machine line, whose identity I must not disclose, where 1,500 men are employed, and where piece work prevails in all departments, so that 90 per cent. of the productive work of the entire establishment is done by piece work; and it may be said of that establishment that there is no cutting of rates there, just as truly as I suppose it is ever said of works where the premium plan is in use. All prices, when made, run for a year. They are not arbitrarily imposed by the employer or his representatives, but are the outcome of fair, free, and friendly conference; and when changes of price are imperative, they are adjusted again in the same way. The works are prosperous continually, and the relations of employers and employees are less strained than they were under other arrangements.

11. It must be evident that none of these premiums or bonus, or other curved or bent or defective line schemes, whatever they may claim in the way of quickening the pace of the worker and increasing the output, can be the most effective, for the reason that they offer a reduced incentive at the precise time when the need of incentive is most urgent. It is the last piece done which comes the hardest, and it is absurd to offer the man half-price or less for doing it. With either of the premium plans doing its best in the way of increased output and reduced labor cost per unit, and with piece work prices adjusted to precisely the same price per piece, the inducement to the worker to increase his output still further must be greater under the piece work than under the premium plan. The guarantee that prices shall not be cut is precisely as applicable to piece work as to the premium plan. The latter has absolutely no monopoly of honesty, no assurance of price maintenance, any more than the other. With equal temptation to cut, and with the same human nature in the boss, the chances of cutting will average precisely equal.

12. With no one having the slightest interest in pushing or advertising piece work, it is advancing on its merits as the most honest way of paying for repetitive work in the machine trade, as in all others. It is worth while to note its popularity and progress, especially in the extensive line of railroad work. The testimony at the meetings of the various railroad organizations is very pronounced in this direction. At the meeting this summer of the Railroad Master Blacksmiths, one man stated that absolutely every job in his shop was done by the piece. When the price could not be placed on the work to be done, it was placed on the "heat." Perhaps it may not be always possible to do this in the machine shop, but whenever the opportunity arises to consider the mode of payment, it should always be in order to ask: What is the matter with piece work?

The True Spirit of Associate Work.

By Mr. Carl F. Drake, Austin, Tex.

There is such a diversity of opinion as to the fundamental principles of associate work that anyone who has been as long connected with its development as the writer almost hesitates a suggestion.

As a fundamental principle, association work was first conceived by our early ancestors for two purposes, primarily self-protection, next after self-protection, education and mutual development. In the early days the savage and the semi-savage tribes banded together for self-protection, and as the first rays of the light of civilization commenced to cast its beams on the world, men banded into guilds to learn better the secrets of their art or craft and improve and develop their work, that in competition they might be stronger. The same principles that applied even before the dawn of Christianity apply to-day. Protection and education must be the cornerstone of all true association work. An organization that is formed to create a trust or monopoly to arbitrarily direct or control must of necessity be of short life, for the reason that the natural greed of man will cause him to so abuse the privilege that he has acquired, that it will force competitors of equal strength to opposition, and they will try to acquire the same power and not limit the scope of their work.

I believe that the direct aim of every organization created, whether of a moral, social, political or commercial nature, should be largely educa

tional. Every association should strive, not by coercion or arbitrary laws to control, but rather by education and persuasion endeavor to direct the thoughts of its members and of those who are outside to the realization of what is best for all concerned.

There is no single mind so strong, so comprehensive, and whose reasoning power is so great, that it can hope to get the same results from the same time and study as could be realized by those who associate themselves together. The many sides of the prism of each day's work lead us to look at it from a different standpoint, and it is in the concentration of these different ideas that come from association that gives to us the best results that we can attain. The true spirit of association work, as we conceive it, is that which strives to accomplish the greatest good for the greatest number, which aims to wipe out and do away with the rough and uncouth methods, and by the concentration of thought and effort bring about a condition that is equitable and fair and give to those both in and out of the association a reasonable profit for their work, at the same time depriving no one of those equal and equitable rights which belong to every man who endeavors to be successful.

Class legislation of tradesmen may be made as unhealthy and dangerous as is the same nature of legislation in State or National affairs. If we were all willing to observe the golden rule of doing unto others as we would that they should do unto us; if we could be satisfied to occupy that channel for which we were created, there would be but little use for organizations; but it is that ambition to take something that is not morally ours which forces those who believe in justice to band together in opposition to the few who are, I might say, almost criminally aggressive.

For nearly 18 years I have been actively interested in associations of lumbermen, street railway, gas and electric people. I have mingled with those interested in the work in almost every State in our Union. I have studied the origin and watched the development of the different trade organizations, and after all these years of experience I have come to the conclusion that the cornerstone of success in the work must be based upon reciprocity, and the most successful way to establish reciprocal relations is by education rather than by coercion. It is true that there are cases in every branch of business when education is not effective, but this is the exception and not the rule, and in these cases, of course, more strenuous methods have to be applied.

Of the many lumber organizations that I have seen come and go in the past 18 years, I have found that education accomplished better results than oppression. It is much easier "to lead the horse to water than to make him drink." It is much easier to show a man where he is wrong, and by moral suasion induce him to do right, than to tell him he is wrong and try to force him into the paths of righteousness.

The many bitter fights and the discord that have wrecked men and fortunes are rather the results in most cases of a misunderstanding of trade ethics than a deliberate intention to violate them. We have tried to teach these principles, and I believe the results to those that have adopted them have been much more satisfactory than harsher methods. The question has often been asked, "What are you to do with your anti-trust laws?" My answer has invariably been: Organize a society that will bear the light of day, such as will meet the approval of the people in general, and then, after this organization is formed, do not hide your work, but go out and tell the people in a general way of your purpose. Of course, the masses are not familiar with the details that apply to your particular craft or trade, but you can give them in a general way such information as will let them understand that your organization is not for the purpose of oppression, but rather for development. Another question that is now attracting the attention of the people is who should organize. I believe that, instead of so many alleged anti-trust laws, that associations amongst skilled labor and capital should be fostered, subject to restraining clauses which will prevent their being oppressive.

I do not believe in the organization of labor that is not skilled. The man who has served his apprenticeship at the bench, at the forge, or at the case, and who by years of effort has acquired a trade, by the time he has perfected himself will be capable of self-government. And when he has reached this stage mentally, then he is in a condition to organize; but the man who has reached the middle stage of life and is still a street sweeper, or shovels, or waits upon the table, I do not believe has sufficient reasoning power to be capable of governing himself, much less a mass of minds that are on an equally low plane. Therefore, I believe that such organizations should be scrutinized very carefully. If the brute strength far exceeds the mental development, then he becomes, when organized, a dangerous factor in the government, and in addition to this, as a rule, he is not willing to submit to arbitration, but generally resorts to brute force, which means anarchy. Then the unprincipled politician steps in and cleverly directs this class of men, who are ready to follow an apostle who seems so much their superior, with the result that honest government is almost in danger.

In conclusion, as I stated at the outset, I believe that the true spirit of associate work should be that which educates and does not coerce.

Utilization of Sulphur in Gas Works: Old and New Methods.

Considering the magnitude of the chemical operations performed in the gas works of the world, it cannot be said that sufficient attention has been bestowed upon the recovery of the by-products. The aggregate of these operations, whether in tonnage or in money value, must place gas manufacture near the head of the list of chemical industries, whilst the affiliated processes of tar distillation and the production of further derivatives, still further increase its importance in the commercial and scientific worlds. Whilst the utilization of tar has received considerable attention, the gaseous by-products generally regarded as impurities have been comparatively neglected. Of these may be mentioned carbon bisulphide, cyanogen, sulphuretted hydrogen, carbon dioxide, and ammonia, every one possessing a value only waiting to be turned to useful account. It cannot, of course, be said that they are entirely unutilized, but they are not dealt with on any comprehensive scheme. Whilst, of necessity, our knowledge grows piecemeal, its practical application has often to wait until it has become sufficiently complete to cover all the requirements of daily working, technical and commercial. For the moment attention is given to only one phase of the subject, but it is of importance to remember that one section cannot be entirely detached from others, except for convenience of investigation.

For some time past it has been regarded as fortunate that in coal gas there exists an alkali capable of removing, if properly applied, the acid impurities sulphuretted hydrogen and carbon dioxide. General practice, however, is content with the removal in this way of 30 per cent. or less of these acid gases. After this removal of sulphur in the form of sulphuretted hydrogen comes the question of its economical use or recovery. Two general methods are open, both of which are followed to an extent which depends largely upon the magnitude of the particular gas making establishment.

The one which is the more economical consists in the burning of the SH_2 in waste gases from the sulphate of ammonia plant into sulphur dioxide at the spent oxide kilns, and passing it thence into lead chambers for oxidation into sulphuric acid. The presence in the mixed gases of a large percentage of CO_2 interferes, however, with satisfactory working and necessitates the use of an abnormal amount of niter. This is the general experience where SO_2 gas from spent oxide or pyrites mingles with that from the SH_2, accentuated, no doubt, by the varying proportion of the latter. Notwithstanding these facts, at one large gas works in the London district, one chamber has been successfully worked by SO_2 from the SH_2 of waste gases only. But when the system is worked at its best the chambers are bulky, costly, expensive in maintenance, and require frequent testing and supervision; and, consequently, it is only permissible where a large quantity, say 2,000 tons, of sulphuric acid is required per annum. In this direction the efforts towards improvement are manifold, some in details of working the chambers, such as using atomized water instead of steam to keep down the temperature, and others in perfecting the catalytic process, already quite successful for the strongest grades of acid. In some of these trials the fuel gases from the combustion of coal or coke containing a normal percentage of sulphur have been taken and their comparatively small percentage of sulphur dioxide (although diluted with nitrogen and carbon dioxide) passed through a catalytic agent maintained at a defined temperature, thereby becoming oxidized to sulphur trioxide, which on mingling with water, yields sulphuric acid. With such results from a gas so poor in sulphurous acid, there is every reason to expect much better ones with the comparatively rich mixture from sulphate of ammonia plants. The action of catalysts is now much better understoood than a few years ago, and platinized substances are giving place to oxide of iron, as in the method of Messrs Lunge and Pollitt. The latter, a young English chemist, has been working at the subject in the light of Continental knowledge, theoretical and practical. At the Badische Aniline and Soda Fabrik, and other large works, the catalytic production has replaced the older methods, because strong acid is made more cheaply, whilst weaker acid is not more costly. However, for gas works purposes, the catalytic method has not yet been adopted, and it is desirable, before adopting it, that further research should be made. The fact that sulphuric acid is not required *per se*, but only for the production of ammonium sulphate, and also that sulphur dioxide readily oxidizes in a current of moist hot air, in the presence of ammonia, forming ammonium sulphate, should afford a basis for investigation such as some of the larger gas companies might undertake. The ultimate end is clear, and the materials composing the finished product are to hand in sufficient proportions, so that it ought not to be difficult to ascertain whether the commercial operations would be satisfactory.

The other method of dealing with or utilizing the sulphur has several modifications, (*a*) absorption in oxide of iron, (*b*) conversion in the Claus kiln, (*c*) getting rid of it by combustion into sulphur dioxide and absorption in a limestone wash tower, (*d*) burning and sending into a chimney, and (*e*) a recent proposal, known as Hemingway's, to render SH_2 innocuous, with partial sulphur recovery. The methods lettered (*c*) and (*d*) of dealing with SH_2 are mentioned to draw attention to their wastefulness. It is probable that they are not extensively used, and that only temporarily. If nothing further can be done, there is always the opportunity of arresting the gas in oxide of iron, which, if the process of the distillation of liquor be continuous, and the area of the boxes sufficient, can be done with considerable efficiency and without loss of money. To accomplish this conveniently two boxes are required. They may be built of brickwork with a pitch filled cavity, and the inlet pipes should have valves arranged to prevent escape of the gas, intentionally or otherwise, into any chimney, or into the atmosphere, without passing first through a considerable depth of oxide of iron. This being one alternative generally available, it becomes necessary that any competitor should be capable of yielding better results. The only successful competitor, as shown by some years of experience, is the Claus kiln, which, producing the sulphur in a more valuable form, yet suffers from the loss of quantity due to conversion of an important percentage into sulphur dioxide. This waste entails the use of a wash tower, which must be lead lined, must receive regular attention, and, if not provided in duplicate, may cause inconvenient stoppages. Further, the wash tower must be followed by an oxide purifier, which, although small, adds to the number of parts and to the area of land occupied by the kiln, chambers, tower, etc. The labor of cleaning out the depositing chambers, the repairs to brickwork, interest and depreciation upon capital, with other charges, usually neutralize the increased value of the sulphur obtained, so that as against oxide of iron boxes there is little gain. It must be acknowledged that, considering the apparent simplicity of the operation, the practical outcome is disappointing; but the seat of the mischief is the quality of the reaction, sulphur dioxide and sulphuretted hydrogen both emerging, even when great care is exercised in the adjustment of air to the kiln. This occurs despite the fact that, under favorable conditions, these two gases decompose, with the deposition of sulphur, according to the following equation:

$$2H_2S + SO_2 = 3S + 2H_2O.$$

In the light of this experience it is desirable to look impartially at Hemingway's proposal. Does it offer a better means of dealing with sulphuretted hydrogen than oxide of iron absorption or the Claus kiln? Or does it provide sulphur to be burnt in the kilns better than burning the sulphuretted hydrogen there? To form an opinion, which, in the absence of experience, must be an undogmatic one, we must look at the reactions and the plant required to carry them into effect. The fundamental reaction of the process is that of the mutual decomposition shown in the above equation. This, to be satisfactory, implies 2 volumes of H_2S to 1 volume of SO_2; and any departure from this relation must be met by some absorbent for the escaping gas. But the ultimate or fundamental reaction is accompanied by intermediate products, which are numerous, and the properties of which must be provided for in their action upon the plant. When H_2S is passed into a solution of sulphurous acid gas, until the latter is completely decomposed, the solution is known as "Wackenroder's solution." This contains sulphur in suspension, and a colloidal form of sulphur in solution with H_2SO_4 (sulphuric acid), $H_2S_2O_3$, $H_2S_4O_6$, and $H_2S_3O_6$ (thionic acids). If the passage of H_2S is continued until all chemical change ceases, the final products are sulphur and water. Bearing in mind that sulphur dioxide acts very rapidly on iron, and that sulphuric and other thionic acids are liable to be present, it will be seen that acid-proof materials must be employed in construction. Ferrous sulphite ($FeSO_3$) is provided in the system as one absorbent for the excess of SH_2. Thus: $FeSO_3 + 3H_2S = FeS + 3S + 3H_2O$. And the ferrous sulphide thus produced is available to act when an excess of SO_2 occurs. Thus: $2FeS + 3SO_2 = 2FeS_2O_2 + S$. And, again, the ferrous thiosulphate thus formed is capable of arresting $H_2$2. Thus: $2FeS_2O_2 + 6H_2S = 2FeS + 8S + 6H_2O$. In all the three reactions sulphur separates.

These solutions are circulated through towers into which the sulphuretted hydrogen and sulphur dioxide gases are admitted as near as may be in the desired proportions, the latter gas being generated by the combustion of a fractional part of the former. The elasticity of the behavior of the absorbents is a distinct feature of the process, and upon the reliability of this the successful working will no doubt greatly depend. But some other points will need to be made clear by a large scale trial. Among such points may be mentioned (*a*) the size and cost of the towers and other apparatus, (*b*) the freedom from stoppage by deposition of the fine sulphur, (*c*) the amount of supervision to control the proportions of gases and absorbents, and (*d*) the value of the sulphur in the particular form and percentage of purity in which it is recovered.

It is to be hoped that an opportunity may occur to permit of these questions being answered, because if the process is found to be decidedly economical as well as devoid of nuisance in its working, there is a large field for its application. A preliminary trial could no doubt be advantageously made by passing the gases of a Claus plant into the Hemingway towers,[1] instead of into a limestone tower and oxide of iron, as at present. Such a gas being a mixture of SH_2, SO_2, CO_2 and air, it is an ideal one for testing, at small cost, the practical value of the system proposed.

Defects of Uncarburetted Water Gas as a Fuel for Laboratory Use.

The *Journal of Gas Lighting* notes that at a meeting of the London Section, Society of Chemical Industry, held in Burlington House, the first week of the year, a paper was read which has interest, in an indirect way, as a contribution to the general subject of uncarburetted water gas. The authors are two chemists in Kyoto, Japan, Drs. Chikashigé and Matsumoto. The paper had been sent to Dr. E. Divers, F.R.S., who claimed the first author as a former pupil, and the second as a grand pupil. While disclaiming all responsibility for the paper, Dr. Divers, recognizing its value, undertook to read it. The greater part of the experimental work contained in it has only an academical interest, and would, even if the paper were available for reproduction, have little real value for our readers. Therefore, some notes taken during the reading of the paper are all that need, or can, be given; and they perhaps may be suggestive of further research work.

An opening remark of the authors was that, to those who have to find a gas fuel for their laboratories, water gas commends itself by the little room taken up by the apparatus for making it, and by the relative simplicity of its manufacture and purification. However, the authors had endeavored to make use of water gas in Bunsen burners in their laboratories; and having become convinced of its inconveniences for this purpose, they offered the information gathered in the hope that it would interest others in the problem of its utilization. The gas which they used was analyzed from time to time. Its average composition was as follows: Hydrogen, 48.8 vols.; methane, 0.8; carbon monoxide, 33.1; carbon dioxide (with some hyd.-sulphide), 8.5; nitrogen, 8.5; oxygen, 0.3. The gas was purified only to the extent deemed sufficient, and was supplied under a pressure of 5 centimeters of water. The plant was set up near to the laboratory; but the gas had to pass through iron pipes. Consequently, iron would have been taken up by the carbon monoxide, and be present in the gas as iron carbonyl.

Adverting to the use of the Bunsen burner with water gas, the authors stated that the composition of the gas made the air ways to the burner almost useless. A problem which had been solved by the authors was as to the order followed in the combustion of the water gas mixture, to find out whether the hydrogen and carbon monoxide burned together, or one before the other. As water gas, when fed with air, burned with a flame having the usual two cones, and could be separated by Professor Smithells' apparatus, an answer could be obtained to this question.

An experiment was made, and gave the result shown in the table, in which are also given Smithells and Ingle's results with coal gas. The numbers given by the water gas showed that about 1 volume of air had been mixed with 2 volumes of the water gas; and that was as much as could be employed. In Smithells' and Ingle's experiments, nearly ten times as much air was used—9.6 parts of air to 2 parts of coal gas. Two points of interest in the comparison are that, in both cases, the volume of the remaining hydrogen was about equal to that of the carbon monoxide, and that the percentage of each gas was only half as great in the partly burned coal gas as in the water gas. It was seen that the fact was established that the hydrogen burned before the carbon monoxide. It followed that the inner cone of the flame of water gas and air was that of the burning hydrogen; and in the outer cone of the flame, the carbon monoxide must be the last constituent to burn.

Partly Burnt Gas.	Water Gas Per Cent.	(Smithells and Ingle.) Coal Gas Vol. Per Cent.
Water	17.0	14.9
Hydrogen	20.0	10.9
Methane	0.3	trace
Carbon monoxide	19.5	10.2
Carbon dioxide	8.8	3.8
Oxygen "	0.1	—
Nitrogen "	14.3	60.3

1. British Patent, No. 9,432, 1899.

The next part of the paper was devoted to the advantages and disadvantages of using water gas. One advantage remarked upon was that the flame needed no air draught to render it smokeless, and to raise its temperature. However, the authors often felt the want of the power to reproduce the luminous smoky flame of the coal gas. Another advantage of the flame was afforded by its particularly high reducing power. A further property possessed to its advantage was its high temperature. There was, in fact, no ordinary gas flame that equalled it. Comparatively thick copper sheets and thin platinum wire were easily heated. On the other hand, the authors called attention to the fact that the water gas flame was much smaller than that of the coal gas Bunsen flame, for the reason that there was so much more to burn in the coal gas. The small flame of the water gas necessarily increased the consumption of the gas for vessels of the same size, when it was desirable to apply the heat over the whole surface. In order to bring up the volume of the water gas flame to that of the coal gas flame, it was necessary to increase the consumption to 2½ times as much. Again, the edges of the flames had a strong oxidizing action on the bottoms of the metal baths used in the laboratory. In addition to this injury, the vessels suffered destruction from the sulphur in the gas. It became almost necessary, therefore, to replace copper water baths with iron ones, and to have air baths with iron bottoms. A great deal of the communication was taken up with this question of injury to metal vessels; and attention was directed to these tables (which were shown on the blackboard) relating to the chemical action produced on metal vessels by the use of water gas, as shown by an investigation of the deposit on them. The nature of the deposit on porcelain and the action of the gas on platinum were illustrated by the following tables:

Deposit	0.0097 gramme.
Carbon dioxide	0.0117 "
Carbon	0.0320 "
Ferric oxide	0.0100 "
Iron	0.0700 "

	Found.	FeC₂.
Carbon	31.9	30
Iron	68.1	70
		100

Platinum Capsule.	Weight.
Before heating	4.7661 grammes.
After 7 hours' heating	4.7664 "
After 5 hours more	4.7666 "
After 10 hours more	4.7672 "

Alluding next to the poisonous character of water gas, and the danger to health from its escape, the authors stated that even during its burning there might be danger. An account of their experiments on this point was included, and a table of results was given, but the latter, without an exact description of the former, would not convey much of value. Briefly, the experiments were made with water gas supplied with air, so as to form an inner cone to the flame; the gas was burned at the rate of 6 cubic feet per hour; and the flames were reduced by a sand tray placed above them. The carbon monoxide escaping from the flame was found to vary greatly according to the position of the tray. The meaning of the set of three results, the authors said, was that 0.57 of carbon monoxide escaped unburnt in 100 volumes of water gas. This compared unfavorably with the result obtained by Thorpe with coal gas—0.37 per cent. From equal sized flames, the carbon monoxide was for water gas 1 volume, and for coal gas 0.37 volume. The authors arrived at the general conclusion that, while 30 coal gas burners might be kept going in a laboratory without detriment, hardly 11 water gas burners could be used with impunity.

The discussion was, through the absence of similar experience to that of the authors, rather discursive. It was considered by Mr. Otto Hehner that the authors had proved the point up to the hilt, that the use of water gas in a chemical laboratory was an undesirable thing. The question was a highly important one, seeing that water gas was being used more and more as an admixture with ordinary coal gas. Some of the London Gas Companies used—he believed reluctantly—something like 25 per cent. of water gas mixed with the ordinary coal gas; and the disadvantages which commonly applied to the pure water gas would apply *pari passu* to the mixture. Of course, they had no remedy. They had to use whatever the gas companies chose or were obliged to supply. The question of the injury to health from the use of water gas seemed a most important one, especially where the gas was burnt constantly; but he had never heard of an analyst being injured by almost any emanation from his experiments. Pointing to the importance of the question of the use of water gas and producer gas, Mr. David Howard remarked that their utilization on a large scale had been worked out; but he thought there was a wide sphere for the employment of comparatively small flames, and yet a great deal larger than the Bunsen burner. The problem required to be worked out to decide whether small gas furnaces could be worked better with one or the other gas—coal gas, which was expensive, or producer gas, which had the advantage of cheapness. With regard to work in the laboratory, he should try, if he used water gas, the old fashioned Argand burner with a metal tube. It had an immense advantage in certain forms of work, because they could get the heat in greater mass. The question was suggested by Mr. Gordon Salamon as to whether the figures given in the paper would be modified by the admixture of the water gas with oil gas as was customary in gas works—whether this gas upon combustion would yield *pari passu* the same results as were recorded in the paper.

The next speaker (Mr. Marshall) was concerned as to the influence upon the health of ordinary consumers who had to use coal gas mixed with water gas. Unfortunately, most people did not pay much regard to the ventilation of their dwelling rooms; and if any amount of carbon monoxide was set free from the combustion of this gas, it was bound to have some effect on the health of people in the rooms in which it was used. The problem, in his opinion, deserved consideration from this point of view. Another member (Mr. Jones), on being invited to speak, said he had only had experience of producer gas, which was a hopeless thing to use in the laboratory, for they had to have their gas pipes double the diameter, and the india rubber tubes of an unwieldy size. The point of Dr. Divers' reply to the discussion was the expression of his opinion that he did not think they need fear the evolution of carbon monoxide in any appreciable quantity from ordinary batswing flames.

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, ENGLAND, Jan. 9th, 1904.

A Retrospect—The Willey Commission to America—A Young Gobbler.

The beginning of another year is naturally suggestive of a backward glance, and as one increases in weight of years and experience there is a greater tendency to dwell on the certainties of the past, rather than on the possibilities of the future, just as the sun throws longer shadows behind us when advancing towards the west, than at noon. It is the old soldier who fights his battles over again, while the young one looks forward to coming glories. And this applies, in some extent, not only to human beings, but also to branches of industry. In the new, untried enterprise we see something of the fire, the impetuosity, and the inexperience of youth, while in the well grounded and extensively established industry there is to be found signs of the ripe judgment, shrewdness and accumulated experience that we associate with middle age.

We are quite familiar with the expression that the gas industry has reached its zenith, usually applied by people who are unable to give chapter and verse for their saying. And in this connection I am reminded of the predicament of a mayor of a provincial town who found himself in the witness box with a shrewd cross-examining counsel in front of him. The mayor had in his evidence-in-chief advanced the view that the district had reached its zenith, and was going back. "If that is so," said the lawyer, "please give me the date when the zenith was reached." The city magnate opined it was about two years ago. Counsel went on to make discomforting references to increase of population, and of ratable value, to important improvements of the sewerage system, and other things all undertaken since the "zenith" was past. Under competent examination the Jeremiahs of the gas industry would be equally confounded, for the past few years have shown an enormous extension in the use of gas, which continues, with no sign of abatement. Ten years ago the slot meter and the incandescent burner were outside the scope of practical politics. Where are they now? Ten years ago there was no commercial department of the gas industry worth the name. The consumer who wanted to know anything could go up to the works— a mile or so out of town—and prospect after the manager, frequently a case of looking for a needle in a bundle of hay. But now a double front show window in a principal street in the central part of the district, with a staff of several well uniformed salesmen, prepared to satisfy any and every inquiry, is quite the usual thing. Take the Salisbury Gas Company for an example. In 1883 the consumption of gas and the number of employees were just half the present figures. No internal fitting was undertaken and in that year the service laying, meter and stove fitting, public lamp repairs, etc., were handled by odd fitters, who filled up their time with blacksmithing and odd jobbing at the works. In 1903 the outdoor department, quite distinct from the works, was composed of a foreman, 7 fitters (one of

whom has been exclusively engaged in laying services), 12 assistants and laborers, and 6 maintenance men who do nothing outside attention to incandescent burners. And this particular instance is not selected from amongst the most progressive undertakings. It is below rather than over the average.

The gas managers' retrospections are apt to be of a jerky or fragmentary character, because the Christmas and New Year season is usually a time of maximum demand, and, therefore, the question of whether the gasholders will keep their heads above water until after 11 o'clock this evening is of more pressing consequence than the events of 5 or 10 years ago. The present winter has been a fairly favorable one. With the exception of a few days frost, the prevailing weather has been dull and cloudy, so that the month of December has generally been a record. In my own working everything has been running at a maximum for the last 6 weeks, and still goes merrily on. The market for coke, tar and sulphate is in fairly satisfactory trim, so that we may hope that the working of the last half year will prove satisfactory.

So far as small and medium-sized works are concerned, there has been very little change. Up to a capacity of 500,000 cubic feet per day, the only important innovation has been the substitution of the deep generator furnace for the shallow open one, and otherwise they are the same, except in respect to size, as 25 years ago. In the purifier house the replacement of the water seal joint by a dry, flexible one, is becoming very general, and something has been done in the way of dispensing with the guide framing of gasholders. But, speaking generally, there has been no striking change. This does not apply to large works which have undergone almost an entire metamorphosis within that period. Formerly the large works was simply a magnified or multiplied small one. But the advent of inclined retorts, mechanical conveying machinery, mechanical drawers, chargers and coke conveyors, has changed all that. Apart from the set of auxiliary water gas plant, there is usually something in the way of heating more than one arch of retorts from one furnace. One arch, one furnace, is no longer the rule. What was an impossibility with the open fire is easy of accomplishment with the generator, and we frequently find 20 or 25 retorts heated from one hearth. With experience of gaseous fuel on the large scale, consIderable developments may be expected in this direction, and it is quite possible that the heat required for all purposes, whether furnaces, boilers or subsidiary uses, will be generated at one spot and laid on round the works just as water or coal gas is now conveyed. Distribution appears the most backward as regards progress, and is still effected, with some few exceptions, at low pressure through large cast iron pipes. The difficulty with regard to new systems in England is that we do not believe in disregarding a piece of apparatus so long as it will possibly hold together. Not one manager in ten would care to go before his committee and ask for the rejection of a comparatively new appliance, and if he did, the chances are that an emergency meeting would be held soon after, to consider the expediency of replacing him by a gentleman of a less progressive turn of mind, who would be content to run the old plant till it burst, without worrying over the fact that he was losing money in doing so. It is very difficult to introduce new departures except by means of the natural opening left for them in the growth or expansion of the concern. Many of our gas works have grown up piecemeal, being enlarged from time to time, not when such became necessary, but at a notable period afterwards, with the result that they cannot possibly be worked to secure the best results, and it is not exceeding sober fact to say that money would be saved in a very few years by clearing away the whole lot and replacing it with a plant of modern design.

The first instalment of Special English Correspondence was forwarded to you in March, 1884, so that my next letter will complete an unbroken record of 20 years, during which period every parcel has been duly delivered and appeared in your columns within the month after despatch. Having endeavored to furnish a faithful record, but which cannot in any sense claim to be exclusive or complete, of gas matters as they transpire in this country, I naturally look with an unusual degree of interest on efforts of a complimentary character describing American happenings for the benefit of British readers. I think it was Americans who first paid us the compliment of coming over to see what we were doing and to make personal acquaintance with British gas people, and that it was not until the principal gas works here were fairly well known in the States, that the idea occurred to some of us that if the American engineer found it pleasant and instructive to have a look around in Europe, we in our turn might gain something by a visit to America. All visits of this nature have hitherto been of a personal or private character, and it remained for a private firm to attempt something of a more official kind. Some time ago Mr. H. A. Willey, head of the firm of Messrs. Willey & Company, of Exeter, visited the States, and was so impressed by his experiences that he decided to send a deputation comprising delegates from each department of his works. The party accordingly left England in November and made a safe return just before Christmas, after visiting Providence, Boston, Syracuse, Buffalo, Toronto, Niagara, Pittsburg, Washington, Philadelphia and New York. The sections represented on the deputation were the foundry, the pattern making department, the slot meter department, the brass workers, the gas engineering department, and the tin plate and gas meter department, and in addition to Messrs. Willey's employees, a representation of a trade union, and of a friendly society in the city. The incident was not allowed to pass without some public recognition in Exeter, as a few days after their return they were entertained by the Mayor and Mayoress at the Guildhall, when a large company assembled and welcomed them. After a welcome from the Mayor, and some remarks by Mr. H. A. Willey, a number of the delegates gave some account of their experiences.

The following may be recommended to the attention of gas consumers who have complaints to make. It is said to have been received in a London gas office. "The penny gobbler you were kind enough to supply me with has ceased to gobble; it apparently seems to have taken offence at something, for when I try to induce it to swallow a penny the coin seems to stick in its throat and will not pass on. * * * If one of your meter specialists should be coming this way might I suggest that they take the meter, which is evidently in a delicate state of health, to a convalescent home and leave one with a more robust constitution in its place." The courtesy and absence of offensive insinuations in this communication certainly affords some improvement on the usual tone of complaints which is something as follows: "The gas supply has failed causing us great loss and annoyance and it is scandalous that, looking at the price paid and the quality supplied, we cannot depend upon an efficient service. If the defect is not remedied to-day we will shut off the gas and adopt other methods." If the slot meter does nothing more than convince consumers that a civil note is likely to secure attention at the gas office and that threats, abuse, or intimidation can well be dispensed with, it will have justified its existence.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

"PACIFIC," writing from San Francisco under recent date says: "The San Diego (Cal.) Gas and Electric Company has recently been threatened with an opposition company, certain parties having applied for a franchise to build telephone lines and to operate a gas and electric plant. It is safe to say that the scheme will not materialize—at least in so far as the gas and electric end of it is concerned. There seems to be a disposition in California to obtain from the municipal councils franchises of this sort for the purpose of trading upon them. As a matter of fact the State laws are such that no municipal franchise is necessary. * * * The Los Angeles Lighting Company recently completed a new 1,000,000 cubic foot, triple-lift gasholder, resting in a steel tank, but so remarkable has been the increase in its sendout that a contract has been placed with the same parties for another one, of similar design and proportions, to rest close beside it. Los Angeles is growing with wonderful rapidity, and is keeping the local Lighting Company busy supplying its demands. * * * The new gas works at Colton, Cal., is rapidly nearing completion. A generator of the crude oil gas type is being installed there. * * * A new gas plant is being installed at Corona, Cal. The generator is to be a new type invented by Mr. Beals, who is in charge of the work, and who was formerly connected with the Redlands (Cal) Gas Company."

WE understand that the Welsbach Light Company has brought suit against Messrs. Lindsay & Co., of Chicago, in the United States Circuit Court asking that the latter be enjoined from manufacturing double-wire cap mantles, and also asking for an award of damages in the sum of $50,000. Plaintiffs aver that the combination of the Lindsay double-wire cap mantle is an infringement of Patent 423,317, issued to Arthur Wald, of Great Britain, March 11, 1890, and assigned to the Welsbach Light Company, February 6th, 1901. Messrs. Lindsay & Co , as we understand it, have decided to contest the complaint, and in the argument will be represented by Messrs. Dyrenforth, Dyrenforth & Lee, patent attorneys, of Chicago.

THE owners of the Williamsburg (Ia.) municipal gas plant—it is a gasoline gas concern—have informed their customers that hereafter the selling rate will be $1.25 instead of $1 per 1,000 cubic feet.

DR. W. W. MCKEE has been appointed receiver for the Lehigh and Northampton Gas and Electric Company, of Catasaqua, Pa.

THE Board of Gas and Electric Light Commissioners, of Massachusetts, has authorized the following issues of new stock: Adams Gas Light Company, $42,700; North Adams Gas Light Company, $100,000; Williamstown Gas Light Company, $20,000, and the Northampton Gas Light Company, $25,000. All of these issues are made to cancel debts of the different Companies.

MR. L. R. DUTTON, Superintendent of the Jenkintown and Cheltenham (Pa.) Gas Company, with headquarters at Wyncote, Pa., is quite well satisfied with the results that have followed the establishing of the new selling rate, which went into effect January 1st. Under the new schedule all gas, for whatever purpose used, will be billed at $1.40 per 1,000 cubic feet, less 10 cents per 1,000 for payment within 10 days. Theretofore, gas for illuminating use was sold at $1.65, less 10 cents for prompt payment, and gas used on fuel account was billed at $1 25, gross and net. The Company has also determined to make a change in respect of special meter service. Heretofore several of its patrons have had the Company maintain for them a meter, free of charge, because of the uncertainty of the electric lighting service. Hereafter, any meters so maintained must show a consumption of 400 cubic feet per month, failing which a bill for 50 cents will be rendered. The Company supplies gas in the towns of Jenkintown, Wyncote, Melrose, Ashbourne, Ogontz Park, Ogontz, Rosslyn Terrace and Glenside, all thriving residential suburbs of Philadelphia, and under the able management of Mr. Dutton its business is growing rapidly.

A CORRESPONDENT in Philadelphia says: "In these days of thermometer-below-zero it is pleasant to note that the energetic gas man is sawing wood, and I give you a quotation from a recent letter from Mr. George W. Beck, the active Superintendent of the works at Sunbury, Pa., who is always up-and-doing. To those familiar with the difficult local conditions of building up a business in Sunbury the information will be of special interest. Mr. Beck wrote: 'I sold the first gas range of the year yesterday, with the thermometer 25° below zero. A customer bought it to avoid the rush! Last month we connected a linotype printing machine, a big coffee roaster and two instantaneous water heaters. We are figuring also on putting in gas to run a chicken incubator!'"

AT the annual meeting of the Brattleboro (Vt.) Gas Light Company the officers chosen were: Directors, H. D. Holton, George C. Averill, J. L. Martin, C. H. Thompson and R. E. Gordon; President, H. D. Holton; Clerk and Treasurer, O. F. Thompson.

JUDGE GROSSCUP, in the United States District Court for Illinois, has decided, in the suit brought by shareholders in the Peoples Gas Light and Coke Company, of Chicago, to determine whether or not the ordinance passed by the authorities of Chicago, declaring that the Company's selling rate should not exceed 75 cents per 1,000 cubic feet, was legal, that the State has never delegated to a city the right to say at what price gas shall be sold therein.

MR. C. J. R. HUMPHREYS has been named by the Massachusetts Board of Gas and Electric Light Commissioners as the expert to assist the Board in appraising the property, exclusive of lands, of the local gas companies that are to go into the combination to be known as the Boston Consolidated Gas Company.

AT the annual meeting of the Cleveland (O.) Gas Light and Coke Company the officers elected were; Directors, C. P. Taft, M. S. Greenough, F. A. Sterling, W. J. Hayes, C. W. Bingham, C. E. Gowen, C. R. Morley and Chas. H. Beardslee—Mr. C. R. Morley succeeds his father, the late Mr. J. H. Morley; President and General Manager, M. S. Greenough; Vice-President, Chas. H. Beardslee; Secretary, Chas. H. Beardslee; Assistant Secretary, J. E. Jackney.

AT a recent meeting of the Directors in the New Haven (Conn.) Gas Light Company the details respecting the increase in its capital stock were perfected. It was voted to issue 4 per cent. in convertible bonds in the sum of $1,000,000, the same to be convertible into stock, at the option of the Directors, on or before April 1, 1915. The right to subscribe to the issue of bonds will be given to stockholders of record, January 19th. Subscriptions will be received on and after to-day, and up to the 15th prox. The payments are to be made in four quarterly instalments, the money paid to draw interest at 4 per cent. from the time of payment of same. The New Haven Trust Company is to attend to the details of the issue. The bonds are to be ultimately convertible into new stock at par.

AT the annual meeting of the Savannah (Ga.) Gas Company the officers chosen were: Directors, Henry Blun, S. H. Adams, Walton Clark, Randal Morgan, Thomas Dolan, Samuel T. Bodine, George Philler, E. L. Brundrett, Geo. S. Philler, Jas. Ball, Lewis Lillie, W. F. Douthirt, W. J. Serrill, F. H. MacMorris and J. A. P. Crisfield; President, S. T. Bodine; Vice-President and Asst. Treas., Jno. W. Golden; Treasurer and Secretary, Lewis Lillie; Asst. Secy., W. F. Douthirt.

THE following circular, issued January 22d, by Mr. John W. Ellis, President and Manager of the Providence (R. I.) Gas Company, explains itself: "To the stockholders of the Providence Gas Company: An increase in the capital stock of the Providence Gas Company having been authorized, the Treasurer will issue 5,000 shares of new stock, which is offered to stockholders of record at the close of business, Monday, March 21, 1904, in the ratio of 1 share of new stock for every 12 shares of old stock held by them as aforesaid, at the par value of $50 per share, payable in cash, on or before Saturday, April 2, 1904. No certificate for fractional parts of shares will be issued, and no rights for fractional parts of shares will be bought or sold by this Company. All new stock not taken and paid for at the close of business, Saturday, April 9, 1904, may be disposed of by the Directors at their discretion."

THE increase in output of gas by the Cincinnati Gas and Electric Company for 1903 as compared with 1902, was no less than 156,006,000 cubic feet. The greatest increase occurred in December; the gain being 24,328,000 cubic feet; the minimum in February, when the gain was 4,942,000 cubic feet. A queer feature of the statistics is that the gain for June exceeded that for September, and another seeming anomaly is that the gain for August was only exceeded by that for December.

ON April 1st Mr. Albert Gallatin will retire from the position of General Manager of the Sacramento (Cal.) Electric, Gas and Railway Company.

THE Los Angeles (Cal.) Lighting Company has a plant up to an output of 6,000,000 cubic feet per day, has 26,000 consumers and 250 miles of main pipes. It sells gas for 95 cents per 1,000 cubic feet, furnishes connections without cost, and sells appliances as per the bills of those from whom it purchases.

THE Cleburne (Tex.) Gas and Electric Company has been incorporated by Mrs. J. D. Oliger, S. C. Padelford, R. B. Sticher, J. F. Strickland, Oscar Goodwin, M. B. Templeton and R. Vickery. It is capitalized in $150,000.

MR, THEODORE CLAUSS has been appointed Treasurer of the Cincinati Gas and Electric Company, vice Mr. Henry A. Barnhorn.

MR. ARTHUR B. FRANTZ has been elected Superintendent of the Chambersburg (Pa.) Gas Company.

THE Board of Gas and Electric Light Commissioners has authorized the Lowell (Mass) Gas Light Company to issue 2,000 shares of additional stock. The upset price placed is $175 per share.

AT the annual meeting of the Newport (R. I.) Gas Light Company the officers elected were: Directors, Melville Bull, Frederick Tompkins, Henry Bull, A. K. Quinn and Thomas A. Lawton; President, Melville Bull; Treasurer, Andrew K. Quinn.

AT the annual meeting of the Houston (Tex.) Gas Light Company the officers elected were: Directors, T. W. House, T. H. Scanlan, H. S. Fox, James A. Baker and Charles Dillingham; President, T. W. House; Vice-President, T. H. Scanlan; Secretary, Treasurer and General Manager, John Shearn; Superintendent, J. H. Fitzgerald.

AT the annual meeting of the Fremont (O.) Gas, Electric Light and Power Company the following officers were elected: President, Jesse C. McDowell; Vice-President and Gen. Mgr., P. W. Lupher; Secretary, Jno. Lumsden; Treasurer, E. P. Whitcomb. Mr. McDowell succeeds Mr. S. A. Wheeler as President of the Company.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

CHAS. E. SANDERSON,
MANAGER.

PUBLISHED ON EACH MONDAY OF THE YEAR AT
No. 42 Pine Street, New York.
Telephone, 2996 John.

MONDAY, FEBRUARY 1, 1904.

The Market for Gas Securities.

The market for city gas shares was dull, and quotations for Consolidated were on the low side. At the close to-day (Friday) the prices were 193¼ to 194. At the annual meeting, held last Monday, the annual reports which, in the absence of President Gawtrey, were read by the Vice-President, Mr. Walter R. Addicks, showed that the business for the year was a record. The percentage increase for the twelvemonth was in excess of 10, and after heavy charges for construction, maintenance and depreciation had been put down, the surplus to credit account was, in round numbers, set at $2,500,000, a gain over the preceding year of $400,000. The officers for 1904 will be named to-day. The regular quarterly dividend of 2 per cent. is payable March 15. The Company's position is simply impregnable.

Brooklyn Union is dull, in fact no transfers of any moment were recorded in the week. Peoples, of Chicago, has passed the par mark, and Washington (D. C.) is 280 bid. San Francisco Gas and Electric is weak, on rumors of more opposition, but the latter is unlikely to come to a head. Baltimore Consolidated is in fair demand, at anything under 60.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

FEBRUARY 1.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	193¼	194
Central Union, Bonds, 5's.	3,000,000	1,000	104	106
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	118	120
Metropolitan	658,000	..	108	112
Mutual	3,500,000	100	260	290
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co. .. Bonds, 5's	11,000,000	1,000	103	105
Northern Union, Bonds, 5's.	1,250,000	1,000	105	106¼
New York and East River .. Bonds 1st 5's	3,500,000	1,000	102	106
" 1st Con. 5's	1,500,000	..	109	111
Standard	5,000,000	100	125	135
Preferred	5,000,000	100	145	155
Bonds, 1st Mortgage, 5's	1,500,000	1,000	116	117
Yonkers	299,630	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	199	199
" " Bonds (5's)	15 000,000	1,000	113	115
Bay State	50,000,000	50	⅛	3/16
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	28	30
" 1st Mtg. 5's	509,000	1,000	93	96
Boston United Gas Co.— 1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47¼	50
Buffalo City Gas Co.	5,500,000	100	4⅝	4¼
" " Bonds, 5's	5,250,000	1,000	65	69
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Cincinnati Gas and Electric Co.	29,500,000	100	97¾	98
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	101	101½
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	88¼	89½
Preferred	3,026,500	100	107½	109
Consumers, Jersey City Bonds	600,000	1,000	100	102
Consumers, Toronto	1,700,000	50	218	225
Consolidated, Baltimore	11,000,000	100	59	60
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	15	17
" Con. Mtg. 5's	880,000	1,000	86	90
Consolidated G. & E. Co.'s. Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co	4,825,500	50	..	50
" Prior Lien 5's	5,603,000	1,000	99½	100
Detroit Gas Co., 5's	361,000	1,000	75	75¼
" Inc. 5's	16,000	100	98½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	39	40
Fort Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	55	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	245	265
Hudson County Gas Co., of New Jersey	10,500,000	..	25	..
" Bonds, 5's	10,500,000	..	101	103
Indianapolis	2,000,000	..	50	65
" Bonds, 6's	2,650,000	..	103½	106½
Jackson Gas Co	250,000	50	73	75
" 1st Mtg. 5's	290,000	1,000	101	102½
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	79	90
Preferred	2,500,000	100	100	104
Bonds	10,000,000	1,000	109½	110
Lafayette Gas Co., Ind.	1,000,000	100	..	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	136	140
Madison Gas & Elec. Co.				
" 1st Mtg. 6's	350,000	1,000	107½	108¼
" 6 per cent. scrip, due 1910	100,000	25	85	87
Montreal, Canada	2,000,000	100	218	184¾
Nashville Gas Lt. Co.	1,000,000	100	110	..
Newark, N. J., Con. Gas Co.	6,000,000	..	56	58
Bonds, 6's	4,600,000	..	105	105¾
New Haven	1,000,000	25	250	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	100¾	101
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	.
Rochester Gas & Elec. Co..	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	15,800,000	100	..	55
St. Joseph Gas Co.				
" 1st Mtg. 5's	751,000	1,000	92	96½
St. Paul Gas Light Co	1,500,000	100	4	47
1st Mortgage 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	2,465,000	1,000	92	93
Syracuse, N. Y.	1,975,000	100	46	48
Bonds	2,047.000	1,000	94	96
Washington, D. C	2,600,000	20	280	285
First mortgage 6's	600,000	..	..	..
Western, Milwaukee	4,000,000	.	..	..
Wilmington, Del	600.000	50	230	..

Advertisers' Index.

GAS ENGINEERS.

A. E. Boardman, New York City ... 192
Baxter & Young, Detroit, Mich ... 192
B. E. Cholliar, St. Louis, Mo ... 178
David Leavitt Hough, New York City ... 192
Economical Gas Apparatus Construct'n Co., Toronto, Ont. ... 184
Frank D. Moses, Trenton, N. J ... 178
Fred. Bredel Co., Milwaukee, Wis ... 180
Frederic Egner, Washington, D. C ... 178
Geo. R. Rowland, New York City ... 182
Humphreys & Glasgow, New York City ... 193
Kerr Murray Mfg. Co., Fort Wayne, Ind ... 192
The Gas Machinery Co., Cleveland, O ... 179
The Jeffrey Manufacturing Co., Columbus, O ... 190
The Western Gas Construction Co., Fort Wayne, Ind ... 160
United Gas Improvement Co., Philadelphia, Pa ... 187
Wm. Henry White, New York City ... 195

GAS WORKS APPARATUS AND CONSTRUCTION.

A. E. Boardman, New York City ... 192
Bartlett, Hayward & Co., Baltimore, Md ... 193
Baxter & Young, Detroit, Mich ... 192
Connelly Iron Sponge and Governor Co., New York City ... 143
Continental Iron Works, Brooklyn, N. Y ... 194
Cruse-Kemper Co., Philadelphia, Pa ... 179
Davis and Farnum Mfg. Co., Waltham, Mass ... 192
Deily & Fowler, Philadelphia, Pa ... 196
Economical Gas Apparatus Construct'n Co., Toronto, Ont. ... 184
Frank D. Moses, Trenton, N. J ... 178
Fred. Bredel Co., Milwaukee, Wis ... 180
G. Shepard Page's Sons, New York City ... 192
Humphreys & Glasgow, New York City ... 193
Isbell-Porter Company, New York City ... 194
Kerr Murray Mfg. Co., Fort Wayne, Ind ... 192
Lloyd Construction Co., Detroit, Mich ... 182
Logan Iron Works, Brooklyn, N. Y ... 196
Quintard Iron Works, New York City ... 193
R. D. Wood & Co., Philadelphia, Pa ... 194
Riter-Conley Mfg. Co., Pittsburg, Pa ... 195
Stacey Mfg. Co., Cincinnati, O ... 195
The Connersville Blower Company, Connersville, Ind ... 197
The Gas Machinery Co., Cleveland, O ... 179
The Jeffrey Manufacturing Co., Columbus, O ... 190
The Western Gas Construction Co., Fort Wayne, Ind ... 160
United Gas Improvement Co., Philadelphia, Pa ... 187

PROCESSES.

Bartlett, Hayward & Co., Baltimore, Md ... 193
B. E. Cholliar, St. Louis, Mo ... 178
Economical Gas Apparatus Construct'n Co, Toronto, Ont. ... 184
Fred. Bredel Co., Milwaukee, Wis ... 180
Humphreys & Glasgow, New York City ... 193
The Gas Machinery Co., Cleveland, O ... 179
The Western Gas Construction Co., Fort Wayne, Ind ... 160
United Gas Improvement Co., Philadelphia, Pa ... 187

SCRUBBERS AND CONDENSERS.

Continental Iron Works, Brooklyn, N.Y ... 194
Economical Gas Apparatus Construct'n Co., Toronto, Ont. ... 184
Fred. Bredel Co., Milwaukee, Wis ... 180
Kerr Murray Mfg. Co., Fort Wayne, Ind ... 192
Logan Iron Works, Brooklyn, N. Y ... 196
R. D. Wood & Co., Philadelphia, Pa ... 194
Riter-Conley Mfg. Co., Pittsburg, Pa ... 195
Stacey Mfg. Co., Cincinnati, O ... 195
The Gas Machinery Co., Cleveland, O ... 179
The Western Gas Construction Co., Fort Wayne, Ind ... 160

PRODUCER POWER PLANTS.

Economical Gas Apparatus Construct'n Co., Toronto, Ont. ... 184
R. D. Wood & Co., Philadelphia, Pa ... 194

TAR AND CARBONIC ACID EXTRACTOR.

Economical Gas Apparatus Construct'n Co., Toronto, Ont. ... 184
Fred. Bredel Co., Milwaukee, Wis ... 180
Stacey Mfg. Co., Cincinnati, O ... 195
The Gas Machinery Co., Cleveland, O ... 179
The Western Gas Construction Co., Fort Wayne, Ind ... 160

AMMONIA CONCENTRATORS.

Fred. Bredel Co., Milwaukee, Wis ... 180
Michigan Ammonia Works, Detroit, Mich ... 180
The Gas Machinery Co., Cleveland, O ... 179
The Western Gas Construction Co., Fort Wayne, Ind ... 160

GAS METERS.

American Meter Co., New York and Philadelphia ... 199
Detroit Meter Company, Detroit, Mich ... 189
D. McDonald & Co., Albany, N.Y ... 197
Helme & McIlhenny, Philadelphia, Pa ... 199
John J. Griffin & Co., Philadelphia, Pa ... 200
Keystone Meter Co., Royersford, Pa ... 198
Maryland Meter and Mfg. Co., Baltimore, Md ... 198
Metric Metal Co., Erie, Pa ... 199
Nathaniel Tufts Meter Co., Boston, Mass ... 198

PREPAYMENT METERS.

American Meter Co., New York and Philadelphia ... 199
D. McDonald & Co., Albany, N. Y ... 197
Helme & McIlhenny, Philadelphia, Pa ... 199
John J. Griffin & Co., Philadelphia, Pa ... 200
Keystone Meter Co., Royersford, Pa ... 198
Nathaniel Tufts Meter Co., Boston, Mass ... 198

PREPAYMENT METER ATTACHMENTS.

Reeves Mfg. Co., New Haven, Conn ... 180

GAS AND WATER PIPES.

Davis & Farnum Mfg. Co., Waltham, Mass ... 192
Donaldson Iron Co., Emaus, Pa ... 184
Economical Gas Apparatus Construct'n Co., Toronto, Ont. ... 184
M. J. Drummond & Co., New York City ... 184
R. D. Wood & Co., Philadelphia, Pa ... 194
Warren Foundry and Machine Co., New York City ... 184

NON-RUSTING PIPE LUBRICANT.

Alan H. Tripp, Chicago, Ills ... 180

GAS COALS.

Berwind-White Coal Mining Co., New York and Phila. ... 190
Perkins & Co., New York City ... 190
Westmoreland Coal Co., Philadelphia, Pa ... 191

SPECIALTIES FOR OIL AND PIPE LINES.

S. R. Dresser, Bradford, Pa ... 181

GAS MAIN STOPPERS.

Safety Gas Main Stopper Co., N.Y. City..... 184

GAS TAPPING MACHINES.

George Light, Dayton, O..... 184
H. Mueller Manufacturing Company, Decatur, Ills..... 181

CANNEL COALS.

Perkins & Co., New York City..... 190

STOKING MACHINERY.

G. A. Bronder, New York City..... 189

CONVEYORS.

Adam Weber Sons, New York City..... 188
C. W. Hunt Company, New York City..... 181
Economical Gas Apparatus Construct'n Co., Toronto, Ont. 184
Fred. Bredel Co., Milwaukee, Wis..... 180
G. A. Bronder, New York City..... 189
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 192
The Brown Hoisting Machinery Co., Cleveland, O..... 176
The Gas Machinery Co., Cleveland, O..... 179
The Jeffrey Manufacturing Co., Columbus, O..... 190
The Link-Belt Engineering Co., Philadelphia, Pa..... 176
The Link-Belt Machinery Co., Chicago, Ills..... 184
The Western Gas Construction Co., Fort Wayne, Ind... 160

CHARGING BARROWS & COAL WAGONS.

Kerr Murray Mfg. Co., Fort Wayne, Ind..... 192
Stacey Mfg. Co., Cincinnati, O..... 195

GAS ENRICHERS.

Standard Oil Co., New York City..... 151
Sun Company, Pittsburg, Pa..... 191
The Sun Oil Co., Pittsburg, Pa..... 191

COKE CRUSHERS.

C. M. Keller, Columbus, Ind..... 191
Fred. Bredel Co., Milwaukee. Wis..... 180
The Jeffrey Manufacturing Co., Columbus, O..... 190

STEAM BLOWER FOR BURNING BREEZE.

The Connersville Blower Company, Connersville, Ind... 187

ECONOMIZERS.

Green Fuel Economizer Co., Matteawan, N.Y..... 182

GAS GAUGES.

The Bristol Co., Waterbury, Conn..... 182

GAS GOVERNORS.

Connelly Iron Sponge and Governor Co., New York City 143
Fred. Bredel Co., Milwaukee, Wis..... 180
Isbell-Porter Co., Newark, N. J..... 194
R. D. Wood & Co., Philadelphia, Pa..... 194

CEMENTS.

C. L. Gerould, Galesburg, Ills..... 188

RETORTS AND FIREBRICKS.

Adam Weber Sons, New York City..... 188
Baltimore Retort and Firebrick Co., Baltimore, Md..... 189
Brooklyn Firebrick Works, Brooklyn, N. Y..... 188
Henry Maurer & Son, New York City..... 188
James Gardner, Jr., Co., Pittsburg, Pa..... 188
J. H. Gautier & Co., Jersey City, N. J..... 188
Laclede Firebrick Mfg. Co., St. Louis, Mo..... 188
Missouri Firebrick Co., St. Louis, Mo..... 188
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 178
The Kreischer Brick Mfg. Co., New York City..... 185

INCLINED RETORTS.

Adam Weber Sons (Graham, Morton [England] System) 188
Connelly Iron Sponge & Gov. Co. (Drake's [Eng.] System) 143
Fred. Bredel Co., Milwaukee, Wis..... 180
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 178

VERTICAL S'S.

Adam Weber Sons (Oscar B. Weber's Construction)..... 188
Connelly Iron Sponge & Gov. Co. (Drake's [Eng.] System) 143
Fred. Bredel Co., Milwaukee, Wis..... 180
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 178

REGENERATIVE FURNACES.

Adam Weber Sons, New York City..... 188
Bartlett, Hayward & Co., Baltimore, Md..... 193
Fred. Bredel Co., Milwaukee, Wis..... 180
J. H. Gautier & Co., Jersey City, N. J..... 188
Laclede Firebrick Mfg. Co., St. Louis, Mo..... 188
Missouri Firebrick Co., St. Louis, Mo..... 188
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 178

SELF-SEALING MOUTHPIECE DOORS.

Continental Iron Works, Brooklyn, N.Y. 194
Fred. Bredel Co., Milwaukee, Wis..... 180
Isbell-Porter Co., Newark, N. J..... 194
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 192
Logan Iron Works, Brooklyn, N.Y..... 196
R. D. Wood & Co., Philadelphia, Pa..... 194
Stacey Mfg. Co., Cincinnati, O..... 195
The Gas Machinery Co., Cleveland, O..... 179
The Western Gas Construction Co., Fort Wayne, Ind... 160

CHIMNEY CONSTRUCTION.

Adam Weber Sons, New York City..... 188

INCANDESCENT GAS LAMPS.

Ball Check Light Co., New York City..... 178
D. M. Steward Mfg. Co., Chattanooga, Tenn..... 180
General Gas Light Co., Kalamazoo, Mich..... 179
Lindsay & Co., Chicago, Ills..... 177
Welsbach Company, Gloucester, N. J..... 186

BURNERS.

D. M. Steward Mfg. Co., Chattanooga, Tenn..... 180
Wm. M. Crane Co., New York City..... 161

LAVA GAS TIPS.

D. M. Steward Mfg. Co., Chattanooga, Tenn..... 180

STREET LAMPS.

Thos. T. W. Miner, New York City..... 181
Welsbach Street Lighting Co., New York and Phila.... 186

PURIFIERS.

Connelly Iron Sponge and Governor Co., New York City. 143
Fred. Bredel Co., Milwaukee, Wis..... 180
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 192
R. D. Wood & Co., Philadelphia, Pa 194
Stacey Mfg. Co., Cincinnati, O..... 195
The Western Gas Construction Co., Fort Wayne, Ind... 160

PURIFYING MATERIALS.

Connelly Iron Sponge and Governor Co., New York City 143

(*Continued on page* 176.)

MRS. HELEN ARMSTRONG,

Teacher of Cookery.

Special Courses Prepared for Gas Companies.

Refers to the following companies for whom such courses have been given:

Burlington, Vt.	Indianapolis, Ind.	Anniston, Ala.
Pittsfield, Mass.	Belleville, Ills.	Van Wert, O.
New York City.	New Orleans, La.	Pueblo, Col.
	Macon, Ga.	

Engagements for ensuing season are now being made.

1493-2eot Address, **159 W. 66th St., Chicago.**

Position Wanted

As Superintendent of Water Gas Plant

In city of 15,000 to 20,000 inhabitants, by an experienced man. Has been successful and can give good references.

1494-tf Address, "M. K.," care this Journal.

MECHANICAL DRAUGHTSMAN,

Age 25, wants a position. Specialties, gas machinery and structural ironwork. Address, "BOX X.,"

1495-2 Care this Journal.

Wanted, Position

AS MANAGER

Of gas, or gas and electric light plant, by a man who can show first-class results in former positions. South or Southwest preferred.

1494-tf Address, "T. W.," care this Journal.

Situation Wanted.

EXPERIENCED MANAGER.

Thoroughly familiar with every department of the business. Coal or water gas. Successful in economical operation and development of new business. Can guarantee results. Young man. Excellent references.

1495-3eot Address, "DIVIDENDS," care this Journal.

Position Wanted.

An Experienced Bench Mason,

Fully competent to take charge of the construction of benches of the most improved pattern, desires a position. Can furnish first-class references. Address, "X. X.,"

1494-2 Care this Journal.

WANTED, POSITION

AS SUPERINTENDENT,

By a first-class gas engineer and superintendent. Understands the manufacture of coal and water gas; also, the laying of high and low pressure mains in detail. Is a successful hustler for new business. Can furnish required references. Address, "UP-TO-DATE,"

1493-3 Care this Journal.

Position Wanted

As Manager or Superintendent,

By a young man familiar with construction and operation of coal and water gas plants, under high or low pressure system of distribution. Best of references furnished.

1493-3 Address, "S.," care this Journal.

WANTED,

By a young man, who is at present manager of a gas company in a city of 35,500 population, a position as manager or superintendent of a gas company in a city of from 30,000 to 60,000 population.

1493-9 Address, BOX 186, NEW BEDFORD, MASS.

WANTED,

A CAPABLE SUPERINTENDENT

For a company located in city of 40,000 inhabitants. . . .
Address, "B.,"

1496-2 Care this Journal.

ENGINEER WANTED.

Competent Young Engineer for Coal Gas Plant,

Which will make 50,000,000 cubic feet per year, and probably 100,000,000 per year within the next five years. Much larger future for right man. Give age, experience, and salary required. Address, "L. G.,"

1495-5 Care this Journal.

WANTED,

An Energetic Young Man,

Preferably married, to take the position of superintendent of a small water gas plant in New England, where considerable extensions are contemplated immediately on the high pressure system. Must be able to furnish good references. Address, stating age, experience, and salary required, to

1495-2 "C. A.," care this Journal.

WANTED,

A Man as General Foreman

For a works in Pennsylvania, making coal and water gas, and putting out over 100,000,000 cubic feet. Must be thoroughly sober, a good mechanic, and accustomed to handling men. Apply, stating wages expected, to

1494-2 "FOREMAN," care this Journal.

GAS PLANT FOR SALE.

A COAL GAS PLANT, in a progressive and growing city of 12,000 people. An excellent opportunity for a man with a small capital. Address, "P. D. S."

1495-4 Care this Journal.

FOR SALE.

500 THREE-LIGHT METERS.

Address the
WATERTOWN GAS LIGHT COMPANY,

1495-4 WATERTOWN, N. Y.

FOR SALE.

One Set of Lowe System Water Gas Apparatus.

Second-hand. For details write to the
DOVER GAS LIGHT COMPANY,

1485-tf DOVER, DEL.

FOR SALE.

Complete 10-foot set of gas apparatus.
Condensers, washer, tar extractor,
Purifiers, valves and dry center-seal.

☞ Perfect condition; can be examined here.

NORTH ADAMS GAS LIGHT CO.,

1490-tf NORTH ADAMS, MASS.

(*Continued from page 175.*)

VALVES.

Continental Iron Works, Brooklyn, N. Y..... 194
Economical Gas Apparatus Construct'n Co.,Toronto,Ont. 184
Isbell-Porter Co., Newark, N. J..... 1 9
Kerr Murray Mfg. Co., Fort Wayne, Ind 192
Ludlow Valve Manufacturing Co., Troy, N.Y..... 181
R. D. Wood & Co., Philadelphia, Pa..... 194
Stacey Mfg. Co., Cincinnati, O..... 195
The P. H. & F. M. Roots Co., Connersville, Ind..... 183
The Western Gas Construction Co., FortWayne,Ind.... 180

EXHAUSTERS.

Connelly Iron Sponge and Governor Co., New York City 143
Isbell-Porter Company, Newark, N. J 194
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 192
The Connersville Blower Company, Connersville, Ind... 193
The P. H. & F. M. Roots Co., Connersville, Ind..... 183

ELECTRICAL APPARATUS.

Wm. Henry White, New York City..... 195

PURIFIER SCREENS.

John Cabot, Hoboken, N. J..... 190

GAS STOVES.

Abendroth Brothers, New York City..... 180
American Meter Co., New York and Philadelphia..... 185
American Stove Co., Cleveland, O 176
Detroit Stove Works, Detroit and Chicago..... 198
Keystone Meter Co., Royersford, Pa..... 198
Maryland Meter and Manufacturing Co., Baltimore, Md. 198
Nathaniel Tufts Meter Co., Boston, Mass..... 198

HOT WATER HEATERS.

Abendroth Brothers, New York City..... 180
The Humphrey Mfg. and Plating Co., Kalamazoo, Mich. 184

GASHOLDER TANKS.

J. P. Whittier, Brooklyn, N.Y..... 182

GASHOLDERS.

Bartlett, Hayward & Co., Baltimore, Md..... 193
Continental Iron Works, Brooklyn, N.Y..... 194
Cruse-Kemper Co., Philadelphia, Pa. 179
Davis & Farnum Mfg. Co., Waltham, Mass..... 192
Deily & Fowler, Philadelphia, Pa..... 196
Economical Gas Apparatus Construct'n Co., Toronto, Ont. 184
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 192
Logan Iron Works, Brooklyn, N Y..... 196
R. D. Wood & Co., Philadelphia, Pa..... 194
Riter-Conley Mfg. Co., Pittsburg, Pa..... 195
Stacey Mfg. Co., Cincinnati, O..... 195

STORAGE TANKS.

Stacey Mfg. Co., Cincinnati, O..... 195

PAINTS.

National Paint Works, New York City..... 192

PATENTS, TRADE-MARKS, COPYRIGHTS.

Royal E. Burnham, Washington, D. C..... 180

FREDERIC EGNER,
Gas Engineer,
WASHINGTON BANK BUILDING, 12TH & G STS., N. W., WASHINGTON, D. C.,
May be consulted with reference to estimates of cost for new, or appraising actual value of existing works; utility of proposed or patented processes; relative earning power to capitalization, and management. Will NOT undertake to furnish apparatus or material, or to contract for the erection of works.

BROWNHOIST CRANES
FOR LIFTING PURIFIER COVERS IN GAS HOUSES.
WRITE FOR PARTICULARS.
The Brown Hoisting Machinery Co.,
1436 St. Clair Street, Cleveland, O.
217 Havemeyer Building, New York.

Every Manufacturing Plant
has coal and ashes to handle in considerable quantities. Why use primitive methods, requiring much time and hand labor, and eating into the expense account?
LINK-BELT ELEVATORS, CONVEYORS
will do the work, whether it be much or little, with a saving in time, work or money, or all three.
LINK-BELT ENGINEERING CO.,
Nicetown, Philadelphia.
New York, 49 Dey St. Pittsburg, Park Bldg. Chicago, Link-Belt Machinery Co.

"Reliable" Gas Stoves and Ranges.

MR. PURCHASING AGENT:

It might be well to note that we always ship your orders on time. **We give particular attention to rush orders!** If you contract with us to deliver any specified number of Gas Ranges, they are always delivered on time. We should be very glad to figure with you on your next order for Gas Ranges, whether it be for one range or a car load.

Allow us also to call your attention to the fact that the "RELIABLE" will always sustain its present good reputation. We endeavor at all times to keep fully abreast of the times. Following the old adage, "We make haste slowly."

If, after careful study and test, we feel satisfied that certain changes are necessary for the sake of permanent improvement in our lines, such changes are only made after they have the approbation and approval of competent gas men. A few valuable changes have been made for 1904. Why not send for a sample range for your inspection?

SCHNEIDER & TRENKAMP CO. DIV.
OF AMERICAN STOVE CO.
CLEVELAND. SAN FRANCISCO. CHICAGO.

90 PER CENT. AIR! 10 PER CENT. GAS!

NO. 5 LINDSAY LAMP.

BEST BURNER.....BEST GLASSWARE.....BEST MANTLE.

CAUTION!

SEE THAT THE NAME
"LINDSAY"
IS STAMPED ON THE BURNER.

CAUTION!

THE BEST RESULTS CAN BE OBTAINED BY USING MANTLES MANUFACTURED BY US.

TURN THE WHEEL TO ADJUST GAS.

LINDSAY & COMPANY,

CHICAGO.

SAMPLE
BALL CHECK
By Mail
(To Dealers)
For a Dime.
They Sell For
A Quarter.

BOOKLET
OF OUR
GAS ARC
LAMPS
for the
Asking.

PARKER-RUSSELL MINING AND MFG. CO.,

PROPRIETORS OF THE

OAK HILL GAS RETORT AND FIREBRICK WORKS.

St. Louis Office: 417 Pine Street. New York Office: Aldrich Court, 45 Broadway.

WE MAKE A SPECIALTY OF WATER GAS LININGS AND CHECKER BRICK.

Half and Full Depth Benches of Our Own Design, Containing 6, 8 or 9 Retorts.

SLOPERS —We have perfected plans of INCLINED RETORT BENCHES, designed to meet conditions prevailing in America, and constructed entirely of American materials.

We Build Benches Complete, Ready for Gas Making. Also

RETORT HOUSES,

COAL and COKE CONVEYING MACHINERY.

Plans, Specifications and Estimates Cheerfully Furnished.

CORRESPONDENCE SOLICITED.

FRANK D. MOSES,

Long Distance Telephone, 1922, Trenton, N. J.

TRENTON, N. J.,

Long Distance Telephone, 1922 Trenton, N. J.

Constructing Engineer and Contractor.

Estimates Furnished on any kind of Work in Connection with Gas or Water Plants.

SPECIAL ATTENTION GIVEN TO THE REMODELLING AND EXTENDING OF THE PROPERTIES OF WORKS NOT UP-TO-DATE.

CORRESPONDENCE SOLICITED.

Chollar's System of Gas Purification.

THE PURIFIED GAS REVIVES THE FOULED OXIDE.

The Gas Engineer's Laboratory Handbook,

By JOHN HORNBY, F.I.C.

Price, $2.50.

A. M. CALLENDER & CO., 42 Pipe St., N. Y. City.

Gas companies that have pushed the installation of Humphrey Gas Arc Lights all report satisfied consumers and largely increased lighting business for 1903.

GENERAL GAS LIGHT CO.,
KALAMAZOO, MICH.

ARTHUR R. CRUSE, President. FRANK FLAVELL, Secretary. AARON E. KEMPER, Treasurer.

Cruse-Kemper Company,

PHILADELPHIA OFFICES: Stephen Girard Building. - - WORKS: Ambler, Pa.

Manufacturers of

Triple, Double and Single-Lift Gasholders,

With or Without Metal Tanks,

Oil and Water Tanks, Purifier Covers, General Plate Metal Work, and Steel Water Towers.

Plans, Specifications and Estimates Promptly Furnished on Request.

P. PLANTINGA, President. W. E. STEINWEDELL, Secretary.

THE GAS MACHINERY CO.,

MAIN OFFICE AND WORKS, CLEVELAND, OHIO.

Coal and Water Gas Apparatus, Bye-Product Machinery, Structural Work and Connections.

J. ALEX. MAYERS, Eastern Agent, : : The Edison Building, 44 Broad St., New York City.

THERE IS NO PLACE LIKE HOME

For buying your burners. American material and American skill are equal to the best in the world in this line. Steward Burners are the best union jet checked burners that can be made. If you will write for samples we will include a sample cake of STAINOFF, free of charge.

D. M. STEWARD MFG. CO., Est. 1876, CHATTANOOGA, TENN., U. S. A.

3

Utilize Your Gas Liquor.
NO EXTRA LABOR OR OPERATING EXPENSES.

IMPROVED AMMONIA CONCENTRATOR.

About 100 in use. Write to
STROH & OSIUS, Patentees, or
MICHIGAN AMMONIA WORKS, - Detroit, Mich.

PATENTS, TRADE-MARKS, COPYRIGHTS.

ROYAL E. BURNHAM,

Solicitor of Patents and Counsellor in Patent Causes.

833 Bond Building, Washington, D. C.

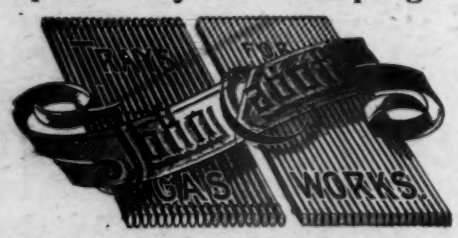
Send for Pamphlet on Patents.

1448-tf

Church's Patent Trays.

Reversible; Strongest; Most Easily Repaired.

Special Trays for Iron Sponge.



1412-1416 Adams Street, Hoboken, N. J.

We also Supply the Cheapest and Strongest

•Reversible Bolted Trays•

IN THE MARKET.

SEND FOR BOOKLET AND CIRCULARS.

A FREE OFFER.

To any Gas Company, on request, I will send a 6-lb. package of **TRIPP'S NON-RUSTING PIPE LUBRICANT,** unexcelled for Gas, Steam and Water Pipe Joint Threads. (You pay express charges only.)

"Non-Rusting" is used by many Gas Companies. I refer to Peoples Gas Light and Coke Co., Chicago; Bloomington Gas Co., Bloomington, Ills.; Canton Gas Co., Canton, Ills., Augusta Gas Co., Augusta, Ga.; Peoples Gas Co., Rutland, Vt., Etc., Etc.

ALAN H. TRIPP, 177 East 40th St., Chicago, Ills., Sole Manufacturer.

"ONCE USED, ALWAYS USED."

FIELD'S ANALYSIS FOR THE YEAR 1902.

An Analysis of the Principal Gas Undertakings in England, Scotland and Ireland. Being the 34th year of publication. Compiled and arranged by JOHN W. FIELD, Sec'y and Gen. Mgr. of The Gas Light and Coke Company, London. Price, $5. For Sale by

A. M. CALLENDER & CO., 42 Pine St., New York City.

A

SAMPLE LETTER

FROM A CUSTOMER.

REEVES PREPAYMENT METER CO., NEW HAVEN, CONN.:

Gentlemen--Please send us as early as possible 150 attachments for 3-light and 150 for 5-light meters. We are much pleased with the attachments in use; they are easily and quickly attached to the meter and their working gives us perfect satisfaction.

Yours very truly, **JAMES SOMERVILLE,**

ENGINEER AND SUPERINTENDENT, INDIANAPOLIS GAS COMPANY.

FRED. BREDEL, President. WM. O. VILTER, Vice-President. O. W. GREENSLADE, Secretary and Treasurer.

FRED. BREDEL COMPANY,

ENGINEERS AND BUILDERS OF GAS PLANTS.

Inclined Benches, own system, Recuperative Furnaces, Exhausters, Exhauster Governors, Condensers, Washers, Coolers, Wet Purifying Plants, Purifiers, Oxide Elevators, Hydraulic and Dry Coke Conveyors.

Special High Grade Material for Recuperative Furnaces.

Licensees for ARROLL-FOULIS Charging and Discharging Machines and FRONHAUSER Coke Conveyors. OFFICE, 405 KEENE ST., MILWAUKEE WIS.

Something New in Gas Water Heaters,

The York All Copper.

Built entirely of Pure Copper Cold Drawn.
Will not Stain the water.
Each Heater tested to 250 pounds water pressure.
Shows an economy of 80 per cent. in actual heat transferred to the water.
Send for sample and price.

109-111 BEEKMAN ST., NEW YORK CITY. **ABENDROTH BROTHERS,** FOUNDRY, PORT CHESTER, N. Y.

Do you know that George Bray & Company made the first burner ever used for acetylene gas?

Have you seen BRAY'S

New "ELTA" Burners?

These are the only Acetylene Burners which can be turned high or low without carbonizing, and, therefore, they remove one of the greatest barriers to the progress of lighting by Acetylene. Write for further information.

WM. M. CRANE COMPANY,

SOLE AGENTS FOR THE UNITED STATES,

1131 Broadway, New York.

Gas Coke Car, with water spray attachment to prevent car from becoming red hot.

Hunt "Industrial" Railway for Gas Works.

We keep in stock a large supply of

Charging Cars,
Coke Cars,
Self Dumping Cars,
Tip Cars.

Write for Catalogue 039, which contains a special offer, whereby a trial test of this system of narrow gauge railway can be made without charge, excepting a few dollars for freightage.

Everything for use with the "Industrial" Railway kept in stock for prompt delivery.

C. W. HUNT COMPANY, WEST NEW BRIGHTON, NEW YORK. NEW YORK OFFICE, 45 BROADWAY.

Mueller Gas Cocks.

B—755.

TOO little is not as much as you pay for, and too much is more paid for than you need.

In **Mueller Gas Cocks** you find a happy medium--not so little metal as to leave them weak, nor yet so much as to make them costly.

Made in 145 styles, seven sizes in each style.

MADE ONLY BY

H. MUELLER MFG. CO.,

DECATUR, ILLS., U. S. A.

THE

Ludlow Valve Mfg. Co.,

TROY, N. Y., U. S. A.

Double and Single Gate Valves, ¼" to 72",

—FOR—

Gas, Water, Steam, Oil, Ammonia, Etc.

HOT GAS VALVES A SPECIALTY.

Send for Catalogue.

SELF-INSTRUCTION

For Students in Gas Manufacture.

Price, $1.25. For Sale by

A. M. Callender & Co.,

42 Pine Street, New York City.

FINANCES OF

Gas and Electricity Manufacturing Enterprises,

By WM. D. MARKS. Price, $1. For Sale by

A. M. Callender & Co.,

42 Pine Street, New York City.

"THE MINER"

Globe Street and Boulevard Lamps.

Cheapest and Best.

THOUSANDS IN USE WITH INCANDESCENT BURNERS.

Send for Catalogues.

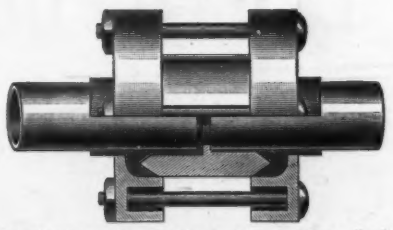
THOMAS T. W. MINER,

821-823 Eagle Av., N.Y.

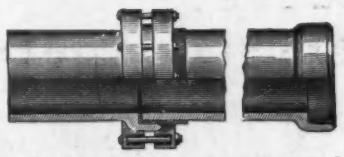
S. R. DRESSER,

BRADFORD, PENNSYLVANIA, U. S. A.,

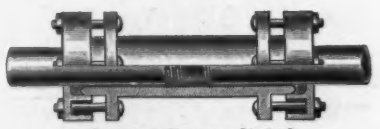
Patentee and Manufacturer of Specialties for Oil and Gas Lines.



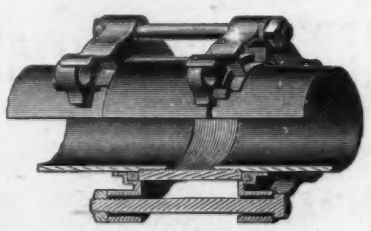
Insulating Coupling for Wrought Iron Pipe. Style 5.



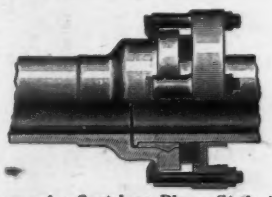
Insulating Coupling for Dresser Bell and Spigot Cast Iron Pipe. Style 6.



Regular Sleeve. Style 2.



Clamp. Style 4.



Clamps for Cast Iron Pipe. Style 4¼.

Pipe Couplings, Sleeves, Clamps, Crosses, Tees and Ells.

My Insulating Coupling prevents the destruction of pipe by electrolytic action, in either water or gas lines.

SEND FOR CATALOGUE.

Did you See the Dry Lute Purifiers at Detroit?

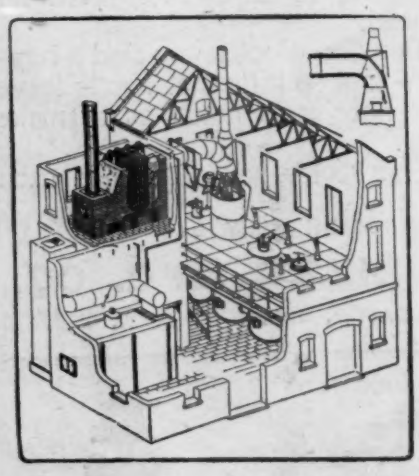
Four 24 x 20 x 11 feet 6 inch Purifiers with Reverse Flow Valve Connections, Patent Safety Discharge Doors, Oxide Elevating Plant, Etc.

LLOYD CONSTRUCTION COMPANY,
DETROIT, MICH.

Economize Heat in Water Gas Plants,

BY UTILIZING A

Green's Economizer,



To absorb the heat now going to waste when you blow through your superheater to heat the feed water for your boilers to the temperature of the steam. This is now being done at the Poughkeepsie Gas Works, Poughkeepsie, N. Y. : : : : :

Write for full particulars how this is accomplished, the saving effected, and the advantages gained, to the

GREEN FUEL ECONOMIZER CO.,
MATTEAWAN, N. Y.

GASHOLDER TANKS AND GAS WORKS MASONRY COMPLETE.

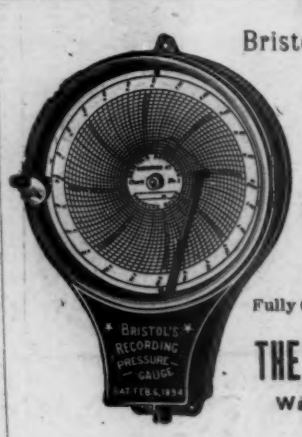
Plans prepared and Estimates furnished at short notice.

J. P. WHITTIER,
238 Java Street, Brooklyn, N. Y.

GEORGE R. ROWLAND,
Formerly with the Continental Iron Works.
Draughtsman and Constructing Engineer.

Drawings, Specifications and Estimates furnished for the construction of new works or alteration of old works. Special attention given to Patent Office drawings.

Office, No. 245 Broadway, N. Y. City.



Bristol's Recording
PRESSURE GAUGE.

For continuous records of **Street Gas Pressure.** Simple in construction, accurate in operation and low in price.

Fully Guaranteed. Send for Circulars.

THE BRISTOL CO.,
Waterbury, Conn.

Silver Medal, Paris Exposition.

Gas Analyses of All Sorts and Conditions,
—OR—
Analyses of Solid and Liquid Materials as Well,

That are needed by Gas Companies at any time in the conduct of their business, may be obtained from

DR. W. H. BIRCHMORE,
1421-tf 341 ADELPHI ST., BROOKLYN, N. Y.

Gas Engineer's Pocket-book, —BY— HENRY O'CONNOR,
Comprising Tables, Notes and Memoranda relating to the Manufacture, Distribution and Use of Coal Gas, and the Construction of Gas Works. PRICE, $3.50. For Sale by
A. M. CALLENDER & CO. 42 Pine St., N.Y. City.

The Advertisement of the

CONNELLY IRON SPONGE AND GOVERNOR COMPANY,

395 Broadway, New York City,

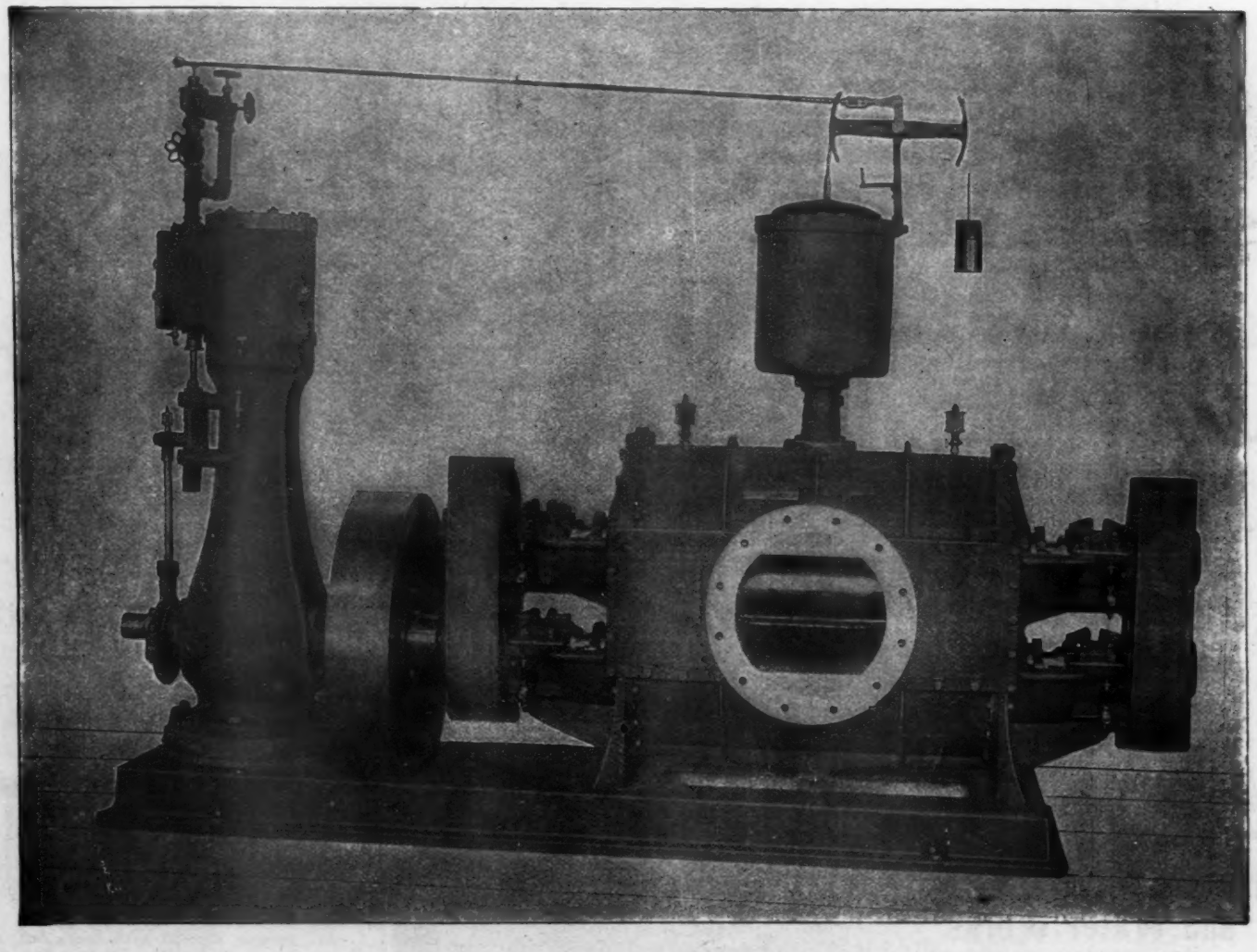
Occupies this Space Every Alternate Week.

ROOTS'

NEW GAS EXHAUSTER.

Always in the lead. Always anticipating the requirements of the trade. Our new Exhauster meets all demands of modern gas making and overcomes all difficulties heretofore experienced.

OUR GAS GOVERNOR IS MAKING FRIENDS EVERY DAY.



P. H. & F. M. ROOTS CO.,

HOME OFFICE: Connersville, Ind. NEW YORK OFFICE: 120-122 Liberty St.

M. J. DRUMMOND & CO.

MANUFACTURERS OF CAST IRON FLANGE GAS AND WATER PIPE

GENERAL SALES OFFICE, 192 BROADWAY, NEW YORK.

GEORGE ORMROD, Manag. & Treas., Emaus, Pa.
JOHN DONALDSON, Prest., Betz Bldg., Phila., Pa.

EMAUS PIPE FOUNDRY.

DONALDSON IRON COMPANY. EMAUS, PA.

MANUFACTURERS OF

CAST IRON PIPE AND SPECIAL CASTINGS

FOR WATER AND GAS.

Also, FLANGE PIPE, LAMP POSTS, Etc.

GAS TAPPING MACHINES

—FOR—

Drilling and Tapping Pipe under Pressure

WITHOUT ANY ESCAPE OF GAS.

They are Strong and Compact.

Size of Combination Drills and Taps ¾ to 4-inch.

Machines Sent to any Gas Company for Thirty Days' Trial.

Send for Circulars.

Geo. Light, DAYTON, O.

THE ECONOMICAL GAS APPARATUS CONSTRUCTION COMPANY, LIMITED,

Consulting Engineers.

Builders of UP-TO-DATE Machinery and Appliances for Coal and Water Gas Plants. :: :: :: :: ::

PLANS, SPECIFICATIONS AND ESTIMATES PREPARED.

AMERICAN OFFICE:
269 Front St., East, Toronto, Canada.

THE

Valuation of Gas, Electricity and Water Works

FOR ASSESSMENT PURPOSES.

THOS. NEWBIGGING, M.Inst.C.E., and WM. NEWBIGGING, Assoc.M.Inst.C.E.

With an Appendix of Decided Cases.

Second Edition. Price $2. For Sale by

A. M. CALLENDER & CO.,
42 Pine Street, N. Y. City.

WARREN FOUNDRY AND MACHINE CO.,

Established 1856. Works at Phillipsburgh, N. J.

New York Office, 160 Broadway.

CAST IRON WATER AND GAS PIPE,

FROM THREE TO FORTY-EIGHT INCHES DIAMETER. ALSO, ALL SIZES OF

Flange Pipe for Sugar House and Mine Work. Branches, Bends, Retorts, etc., etc.

SAFETY GAS MAIN STOPPER COMPANY,

For Shutting Off Gas in Mains

Any size gas main can be shut off in 30 seconds. : : :

Temporarily during alterations and repairs. : : : :

STOPPERS SENT ON TRIAL.

Address: SAFETY GAS MAIN STOPPER CO., 108 E. 117th St., New York City.

THE No. 8

Humphrey Crescent Instantaneous Water Heater

IS A QUICK SELLER.

PRICE,

$20.00.

SHELF AND BRACKET FREE.

HAS NO EQUAL AT THE PRICE.

TRY ONE AND BE CONVINCED. WILL SEND ON 60 DAYS' APPROVAL.

HAVE YOU OUR CATALOGUE?

The Humphrey Mfg. and Plating Co.,

KALAMAZOO, MICH., U. S. A.

Application at Collingwood.
Shops L. S. & M. S. R. R., Cleveland, O.

LINK-BELT

Overlapping

PIVOTED BUCKET CARRIER.

(PATENTED.)

A single machine will handle both coal and ashes in boiler room. It is automatic, efficient, durable, occupies little space, and saves money. Can be adapted to a wide range of special conditions. : : : : : :

Link-Belt Machinery Co.,

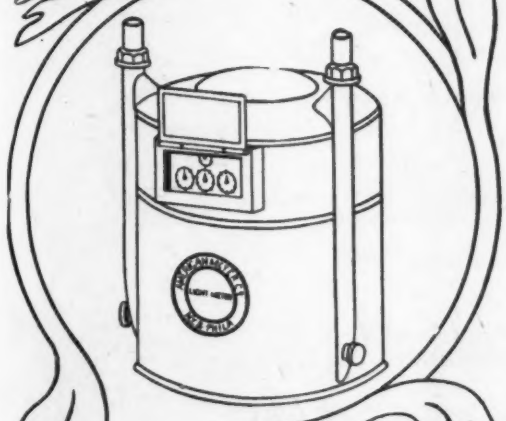
LINK-BELT ENGINEERING CO., Philadelphia. Chicago.

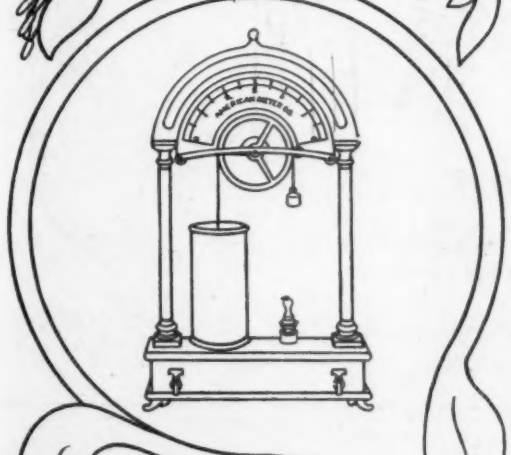
(Copyrighted, 1894, by the AMERICAN METER CO.)

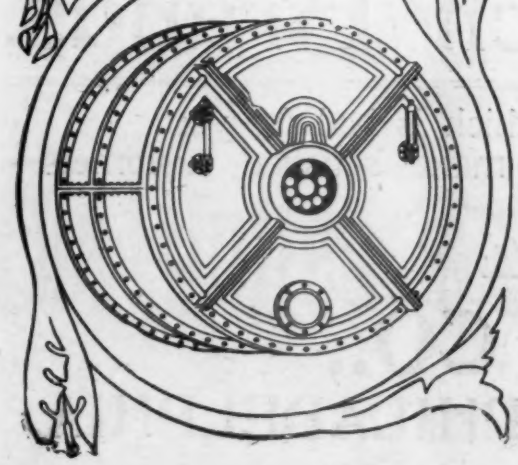
AMERICAN METER CO.

ESTABLISHED 1836. INCORPORATED 1868.

NEW YORK
PHILADELPHIA,
CHICAGO,
ST LOUIS,
SAN FRANCISCO.







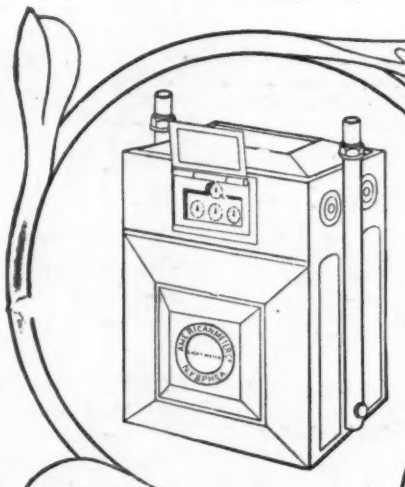
PUBLIC LIGHTING TABLE.

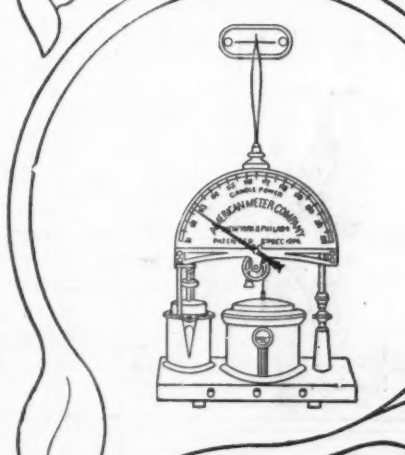
FEBRUARY, 1904.

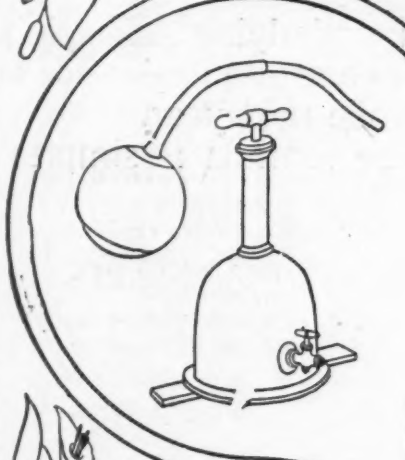
Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Table No. 1. Following the Moon. Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Table No. 2. New York City. All Night Lighting. Extinguish.
				P.M.	A.M.
Mon.	1	No L. FM	No L.	5.05	6.15
Tue.	2	No L.	No L.	5.05	6.15
Wed.	3	5.50 PM	9.00 PM	5.05	6.15
Thu.	4	5 50	10.20	5.05	6.15
Fri.	5	5.50	11.20	5.10	6.10
Sat.	6	5.50	12.30 AM	5.10	6.10
Sun.	7	6.00 LQ	1.30	5.10	6.10
Mon.	8	6.00	2.30	5.10	6.10
Tue.	9	6.00	3.30	5.10	6.10
Wed.	10	6.00	4.20	5.10	6.10
Thu.	11	6.00	5.10	5.10	6.10
Fri.	12	6.00	6.00	5.20	5.55
Sat.	13	6.00	6.00	5.20	5.55
Sun.	14	6.10	5.50	5.20	5.55
Mon.	15	6.10 NM	5.50	5.20	5.55
Tue.	16	6.10	5.50	5.20	5.55
Wed.	17	6.10	5.50	5.20	5.55
Thu.	18	6.10	5.50	5.20	5.55
Fri.	19	6.10	5.50	5.30	5.55
Sat.	20	8.50	5.50	5.30	5 55
Sun.	21	9.50	5.40	5.30	5.55
Mon.	22	10.50	5.40	5.30	5.55
Tue.	23	11.50 FQ	5.40	5.30	5.55
Wed.	24	12.50 AM	5.40	5.30	5.55
Thu.	25	1.40	5.40	5.30	5.55
Fri.	26	2.40	5.40	5.30	5.45
Sat.	27	3.30	5.40	5.30	5.45
Sun.	28	4.20	5.40	5.30	5.45
Mon.	29	No L.	No L.	5.30	5.45

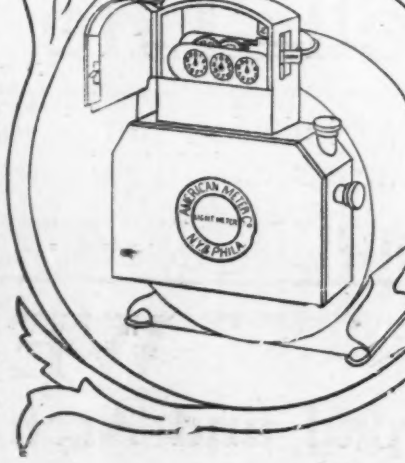
TOTAL HOURS LIGHTING DURING 1904.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	225.00	January	423.20
February	205.40	February	367.40
March	187.40	March	355.35
April	169.50	April	298.50
May	152.30	May	264.50
June	137.20	June	234.25
July	138.50	July	243.45
August	151.00	August	280.25
September	164.40	September	321.15
October	191.30	October	374.30
November	210.30	November	401.40
December	237.10	December	433.45
Total, yr.	2171.40	Total, yr.	4000.00





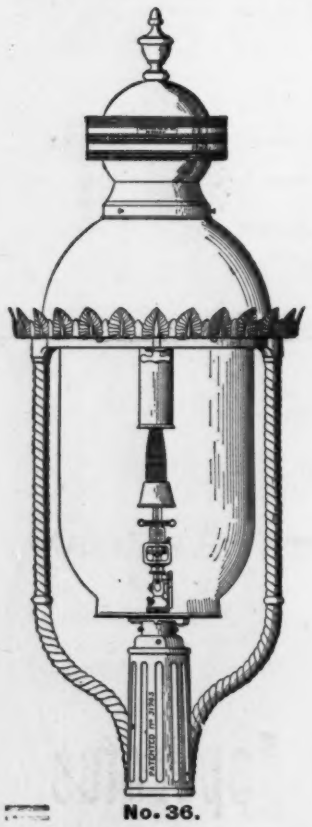




NEW YORK, 33 Nassau Street.
BOSTON. 814 Beacon Building.
PHILADELPHIA, Broad and Arch Streets.
ST. LOUIS, 712 Roe Building.
CHICAGO, Foot of Orleans Street.
SAN FRANCISCO, 712 Polk Street.

WELSBACH STREET LIGHTING COMPANY

.... OF AMERICA ....



No. 36.

Controls and Operates the

Welsbach System of Street Lighting,

Which includes its specially DESIGNED AND PATENTED BURNER for STREET and PARK LIGHTING exclusively.

Uniformly SUCCESSFUL in 150 Cities and Towns.

By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

Correspondence Solicited from Gas Companies and Others interested in Municipal and Outside Lighting.

No. 38.

AN underlying principle in business is to show an increase each year---to grow. The astute dealer not only seeks to retain this year's customers, but to attract new trade next year.

The formula is simple-

THIS SHIELD IS THE WELSBACH TRADE MARK.

IT IS A GUARANTEE AND A PROTECTION.

Sell The Welsbach Brands.

The imitation stuff is bad for the customer---which is bad for you.

The genuine Welsbachs---Burners or Mantles---make satisfied customers---keep customers---MAKE NEW ONES.

And your profit isn't merely dollars and cents.

WELSBACH CO.,

Broad and Arch Sts., PHILADELPHIA.

THE UNITED GAS IMPROVEMENT COMPANY

For the Year Ending December 31, 1903, has been Awarded Contracts in the Following Places for

Standard Double-Superheater Lowe Water Gas Apparatus.

Rochester, N. Y.	Chester, Pa.	Savannah, Ga.
Baltimore, Md.	Lynn, Mass.	New York (Central Union Co.)
Chicago, Ills.	Newark, N. J.	Cicero, Ills.
Amesbury, Mass.	Washington, D. C.	Chicago (Ogden Co.)
Aberdeen, S. D.	Boone, Ia.	Easton, Pa.
Winsted, Conn.	Pueblo, Col.	Lawrence, Mass.
Canon City, Col.	Charlotte, N. C.	Council Bluffs, Ia.
Schenectady, N. Y.	Fall River, Mass.	Chattanooga, Tenn.
Hagerstown, Md.	Duluth, Minn.	Tuckerton, N. J.
Malden, Mass.	New York (Mutual Co.)	Springfield, O.
Bridgeport, Conn.	Waltham, Mass.	Easton, Pa. (2d contract).
Albert Lea, Minn.	Dover, Del.	Mobile, Ala.
Brooklyn, N. Y.	York, Pa.	Conshohocken, Pa.
Kansas City, Kas.	Minneapolis, Minn.	Mason City, Ia.
Hempstead, N. Y.	Allentown, Pa.	

TOTAL SETS FOR 1903, ... 62
TOTAL DAILY CAPACITY, ... 62,950,000 cubic feet.
TOTAL SETS TO DATE, ... 508
TOTAL DAILY CAPACITY, ... 362,780,000 cubic feet.

The United Gas Improvement Company,

Broad and Arch Streets, Philadelphia.

Established 1858. Incorporated 1890.
Chas. E. Gregory, Prest. David R. Daly, V.-Prest. & Treas.
H. D. Abernethy, Sec.

J. H. Gautier & Co.

Greene & Essex Streets,
Jersey City, N. J.

MANUFACTURERS OF

CLAY GAS RETORTS, FIRE CLAY TILES, FIRE BRICK and FIRE CLAY SPECIALTIES.

Ground Fire Clay, Fire Sand and Ground Fire Brick in Barrels and Bulk.

SOLE MANUFACTURERS OF THE

FLEMMING GENERATOR GAS FURNACE

Brooklyn Fire Brick Works,

OFFICE AND WORKS:
88 VAN DYKE ST., BROOKLYN, N. Y.
MANUFACTURERS OF
CLAY GAS RETORTS & SETTINGS, GENERATOR LININGS. SPECIALTIES.

Established 1854. Incorporated 1869.

LACLEDE
Fire Brick Manufg. Co.,

Manufacturers of { GAS RETORTS . .
FIRE BRICK . . .
RETORT SETTINGS

Water Gas Cupola Linings, Fire Clay, Etc.

Proprietors for the U. S., Coze System of Inclined Benches.

Estimates Furnished on Application for Most Successful Style of Construction.

Also for Free-Firing and Full and Half-Depth Regenerative Benches, for Burning either Coal or Coke in the Furnaces.

Office:
Cor. Manchester and Sulphur Avenues, St. Louis, Mo.

Established 1845. Reorganized 1902.

The Kreischer Brick Mfg. Co.,

Manufacturers of the very best quality of Clay Retorts, Blocks, Tiles, Settings and Firebrick of every description.

Also Miners and Shippers of Fireclay, Fire Sand, Ground Brick in Barrels.

WORKS: KREISCHERVILLE, STATEN ISLAND.
OFFICE: 119 E. 23D STREET, NEW YORK CITY

Adam Weber Sons.

Works, Weber, N. J.
Main Offices, Park Row Bldg., New York.

Modern Recuperative Furnaces.

Standard Fire Brick and Gas Retorts.

OSCAR B. WEBER'S

Construction Vertical 8's (Patented), First Instalment in the World with Modern Charging and Discharging Machinery.

AGENTS FOR

GRAHAM, MORTON & CO.,

LEEDS, ENGLAND,

INCLINED RETORT SYSTEM.

BUILDERS AND DESIGNERS OF

Perforated Radial Block Chimneys.

ISAAC C. BAXTER, President. ESTABLISHED 1864. PETER YOUNG, Sec'y and Treas.

Works.
LOCKPORT STATION, PA.

JAMES GARDNER, JR., CO.,

Address all communications to
JAMES GARDNER, JR., CO., Room 202 Lewis B'l'dg
PITTSBURGH, PA.

Successor to WILLIAM GARDNER & SON.

Fire Clay Goods for Gas Works.

HENRY MAURER & SON,

(Established 1856.)

EXCELSIOR FIRE BRICK & CLAY

RETORT WORKS

WORKS, Perth Amboy, N. J.
OFFICE, 418 to 422 East 23d St., N. Y.

Clay Gas Retorts,

BENCH SETTINGS,

Fire Brick, Tiles, Etc.

GEROULD'S IMPROVED RETORT CEMENT

A Cement of great value for patching retorts, putting on mouthpieces, making up all bench-work joints, lining blast furnaces and cupolas. This cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick.

Price List, f.o.b. Galesburg, Ills., or Buffalo, N. Y.

In Casks, 400 to 800 pounds, at 5 cents per pound.
In Kegs, 100 to 200 " " 6 " "
In Kegs less than 100 " " 7 " "

C. L. GEROULD, Galesburg, Ills.

For orders East of Buffalo, N. Y., or Pittsburg, Pa., freight will be paid to these points.

The Gas Engineer's Pocket-Book,

By HENRY O'CONNOR.

Comprising Tables, Notes and Memoranda relating to the Manufacture, Distribution and Use of Coal Gas, and the Construction of Gas Works.

PRICE, $3.50.

For Sale by

A. M. CALLENDER & CO., 42 Pine Street, New York City.

Theo. J. Smith, Prest. J. A. Taylor, Sec.
A. Lambla, Vice-Prest. and Supt.

BALTIMORE RETORT & FIRE BRICK CO.

MANUFACTORY AT

LOCUST POINT, BALTIMORE, MD.

Clay Retorts, Blocks & Tiles

FIRE BRICK, FIRE CLAY, AND FIRE CEMENT.

Our Improved Half and Full Depth Benches have been Adopted by Many Gas Companies.

WALDO BROS., 102 MILK ST., BOSTON, MASS.

Sole Agents for New England States.

JOHN DELL,
President and General Manager.

MISSOURI FIRE BRICK CO.,

ESTABLISHED 1882.

MANUFACTURERS OF

Gas Retorts, Bench Settings, Fire Brick, Cupola Linings, Etc.

We are the Exclusive Agents *for the* Mitchell Patent Benches, *Constructed with Half or Full Depth Furnaces, to Burn either Coal or Coke, and Arranged for Front or* Rear Clinkering. The Mitchell *is the* Original Coal Firing Bench. *We also Erect Plain Benches with* One *to* Six Retorts.

YOUR CORRESPONDENCE IS RESPECTFULLY SOLICITED.

City Office:
411 Olive Street,
Continental Bank,
ST. LOUIS, MO.

Bronder Patent Stoking Machinery.

Three-Scoop and Three-Rake Charging and Discharging Machines are operating in New York, Newark, N. J., Philadelphia, Worcester, Mass., Mt. Vernon, N. Y., Toronto and Montreal, Canada.

Four-Scoop and Four-Rake Charging and Discharging Machines are being furnished for Detroit, Mich.

These are the only machines that will draw or charge simultaneously three or four retorts (vertically) and handle from 42 to 60 retorts in from 25 to 30 minutes, lid opening and closing and filling of furnaces included.

Hot Coke Conveyor, Quencher and Steam Exhauster, operating in Toronto, Can., working in water-sealed flue, rollers being protected from heat and grit.

COAL CRUSHERS, CONVEYORS AND BINS. TURNTABLES FOR MACHINES.

Labor-Saving Machines for Handling Coal and Coke from Coal Cars to Coke Yard or Bins, a Specialty.

G. A. BRONDER,
Contracting Engineer and Builder,
229 BROADWAY, NEW YORK.

SCIENTIFIC BOOKS.

ELECTRIC GAS LIGHTING. By H. S. Norrie. 50 cents.

GAS ANALYST'S MANUAL. By J. Abady. $6.50.

COX'S GAS FLOW COMPUTER. $2.50.

FIELD'S ANALYSIS, 1902. $5.

HUGHES' GAS WORKS. $1.65.

POOLE ON FUELS. By Herman Poole. $3.

GAS ENGINEER'S POCKET-BOOK. By Henry O'Connor $3.50.

TECHNICAL GAS ANALYSIS. By Winkler & Lunge. $4.

GAS CONSUMER'S HANDYBOOK, by Wm. Richards. 20 cents.

PRACTICAL TREATISE ON HEAT. By Thomas Box. 2d edition. $5.

PRACTICAL PHOTOMETRY: A Guide to the Study of the Measurement of Light. By W. J. Dibdin. $3.

CHEMICAL TECHNOLOGY: Vol. I., *Fuel and Its Applications*, $5. Vol. II., *Lighting*, $4.

IRONWORK: Practical Designing of Structural Ironwork. By H. Adams. $3.50.

HEMPEL'S GAS ANALYSIS, $2.25.

SELF-INSTRUCTION FOR STUDENTS IN GAS MANUFACTURE. $1.25.

LIQUID FUEL FOR MECHANICAL AND INDUSTRIAL PURPOSES. By E. A. Brayley Hodgetts. $2.50.

PRACTICAL HANDBOOK ON GAS ENGINES, by G. Lieckfeld. $1.

HEAT A MODE OF MOTION. By John Tyndall. $2.50.

THEORY OF HEAT. By J. Clerk-Maxwell. $1.50.

MANUAL FOR GAS ENGINEERING STUDENTS. By D. Lee. 40 cents.

AMMONIA AND AMMONIUM COMPOUNDS. By Dr. R. Arnold. $2.

A TREATISE ON THE COMPARATIVE COMMERCIAL VALUES OF GAS COALS AND CANNELS. By D. A. Graham. $3.

A TEXT BOOK OF INORGANIC CHEMISTRY. By Prof. Victor Von Richter. $2.

ILLUMINATING AND HEATING GAS. By W. Burns. $1.50

HANDBOOK FOR MECHANICAL ENGINEERS. By H. Adams. $2.50.

TREATISE ON MASONRY CONSTRUCTION. Baker. $5.

GAS ENGINEER'S LABORATORY HANDBOOK. By Jno. Hornby. $2.50.

FINANCES OF GAS AND ELECTRICITY MANUFACTURING ENTERPRISES. By Wm. D. Marks. $1.

PRACTICAL PLUMBING. By P. J. Davies. Vol. I. $3, Vol. II. $4.50.

AMERICAN PLUMBING. By Alfred Revill. $2.

A COMPARISON BETWEEN THE ENGLISH AND FRENCH METHODS OF ASCERTAINING THE ILLUMINATING POWER OF COAL GAS. $1.60.

ELECTRICITY.

INDUSTRIAL PHOTOMETRY, with Special Application to Electric Lighting. By A. Palaz, Sc.D. $4.

ELEMENTS OF ELECTRIC LIGHTING, Including Electric Generation, Measurement, Storage and Distribution. By Philip Atkinson. $1.50.

ELECTRIC TRANSMISSION OF ENERGY. By G. Kapp. $3.50.

ELECTRICIAN'S POCKET-BOOK. By Monroe and Jamieson. $2.50.

DYNAMO BUILDING. By F. W. Walker. 50 cents.

DOMESTIC ELECTRICITY FOR AMATEURS. By E. Hospitalier. $2.50.

PRACTICAL MANAGEMENT OF DYNAMOS AND MOTORS. $1.

PRACTICAL GUIDE TO THE TESTING OF INSULATED WIRES AND CABLES. $1.

ELECTRIC LIGHTING, by Francis B. Crocker. $3.

ELECTRIC LIGHT FITTING. $2.

PRACTICAL ELECTRICITY. $2.50.

ELECTRICITY FOR ENGINEERS. $2.50.

ELECTRICITY, Its Theory, Sources and Applications. By John T. Sprague. $6.

The above will be forwarded upon receipt of price. If sent by mail or express, postage or express charges must be added to above prices. We take especial pains in securing and forwarding any other Works that may be desired, upon receipt of order. All remittances should be made by check, draft, or post office money order. No books sent C.O.D.

A. M. CALLENDER & CO., 42 PINE ST., NEW YORK.

JAMES D. PERKINS, President. F. SEAVERNS, Treasurer.

THE PERKINS COMPANY,

228 and 229 Produce Exchange, New York City.

TIDEWATER SALES AGENTS FOR THE FOLLOWING:

Ocean Mine Youghiogheny Gas Coal,
Old Kentucky Shale and O. K. Boghead.

SHIPMENTS FROM NEW YORK, PHILADELPHIA, BALTIMORE AND NORFOLK.

BERWIND-WHITE COAL MINING COMPANY'S

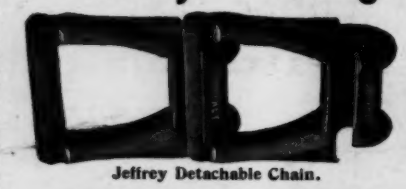
Ocean Westmoreland Gas Coal.

Offices:
Washington Building, New York.
Betz Building, Philadelphia.

STRICTLY High Grade. . . . .
Carefully Prepared.
For Gas Making or
Heavy Steaming. .

A. C. M. AZOY, General Agent, 1 Broadway, New York.

Jeffrey Elevating-Conveying Machinery



Jeffrey Detachable Chain.

FOR HANDLING

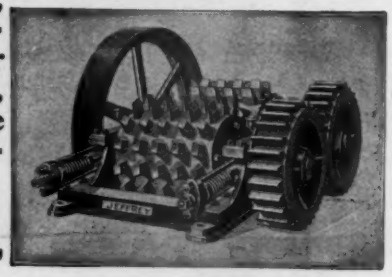
COAL, COKE, ETC.

MAY WE SEND YOU COPY OF OUR CATALOGUE NO. 722.

Shaking Screens, Dump Cars, Power Transmission Machinery, Chains, Elevator Buckets, Sprocket Wheels, Crushers, Screens, Cable Conveyors, Spiral Conveyors, Etc.

ADDRESS

THE JEFFREY MFG. COMPANY,
COLUMBUS, OHIO, U. S. A.
NEW YORK : : : CHICAGO : : : DENVER.



Coal and Coke Crushers.

The Gas Engineer's Laboratory Handbook,

By JOHN HORNBY, F.I.C. Price, $2.50.

Orders may be sent to

A. M. CALLENDER & CO., 42 Pine St., N. Y.

COAL TAR
— AND —
AMMONIA.

Third and Enlarged Edition.

BY

GEORGE LUNGE, Ph.D.

Price, $15. For Sale by

A. M. CALLENDER & CO.,
42 Pine Street, New York City.

ELECTRIC GAS LIGHTING.

How to install electric gas igniting apparatus, including the jump spark and multiple systems for use in houses, churches, theaters, halls, schools, stores or any large building. Also, the care and selection of suitable batteries, wiring and repairs.

By H. S. NORRIE.

Price, 50 cents. Orders may be sent to

A. M. CALLENDER & CO., 42 PINE ST., N. Y CITY.

HUGHES' "GAS WORKS,"

Their Construction and Arrangement, and the Distribution of Coal Gas.

Originally written by SAM'L HUGHES, C.E. Rewritten and much enlarged by WM. RICHARDS, C.E.

Eighth Edition, Revised, with Notices of Recent Improvements. Price, $1.65.

A. M. CALLENDER & CO., 42 PINE ST., N. Y. CITY.

KELLER ADJUSTABLE COKE CRUSHER.

Strong, Simple, Durable. Will Crush any Size Desired.

C. M. KELLER,
Sec. & Supt. Gas Lt. & Coke Co.,
Columbus, Ind.
Correspondence Solicited.

Do You Wish to Know

what size of pipe to use to convey any quantity of gas, any distance, with any loss of pressure and any initial or final pressure? Then use

Cox's Gas Flow Computer,

as it gives this information accurately at sight, without mental effort. No calculations needed. Saves time, money and mistakes.

Price, 6.5 x 8 inches, in cloth case, $2.50.
For sale by

A. M. Callender & Co., 42 Pine St., N. Y.

POOLE ON FUELS.

THE CALORIFIC POWER OF FUELS.

By HERMAN POOLE, F.C.S.

Second Edition. Price, $3. For Sale by

A. M. CALLENDER & CO., 42 Pine St., N.Y. City.

BINDER for the JOURNAL.

Price, $1.00.

A. M. CALLENDER & CO., 42 Pine Street, N.Y.

Edmund H. McCullough, President. Chas. F. Godshall, Treasurer. H. C. Adams, Secretary. Henry Wharton, Assistant Secretary.

THE WESTMORELAND COAL CO.

Chartered 1854.

Mines situated on the Pennsylvania and the Baltimore and Ohio Railroads, in Westmoreland County, Pa.

POINTS OF SHIPMENT:

PHILADELPHIA, BALTIMORE, SOUTH AMBOY, N. J.,
WATKINS (SENECA LAKE), N. Y.

Since the commencement of operations by this Company its well-known Coal has been largely used by the Gas Companies of New England and the Middle States, and its character is established as having no superior in gas-giving qualities, and in freedom from sulphur and other impurities.

Principal Office, 224 South 3d St., Phila., Pa.

SUN COMPANY,

PRODUCER, REFINER, SHIPPER AND EXPORTER OF

Petroleum and All Its Products.

Pittsburg, Pa., and Philadelphia, Pa.

THE SUN OIL CO.

Gas Oil, Gas Naphtha,
Refined Oil, Lubricating Oils.

Toledo, O., and Pittsburg, Pa.

PRACTICAL PHOTOMETRY,

By WILLIAM JOSEPH DIBDIN,

PRICE, $3. FOR SALE BY

A. M. CALLENDER & CO., 42 Pine Street, New York City.

PRACTICAL HANDBOOK ON

GAS ENGINES,

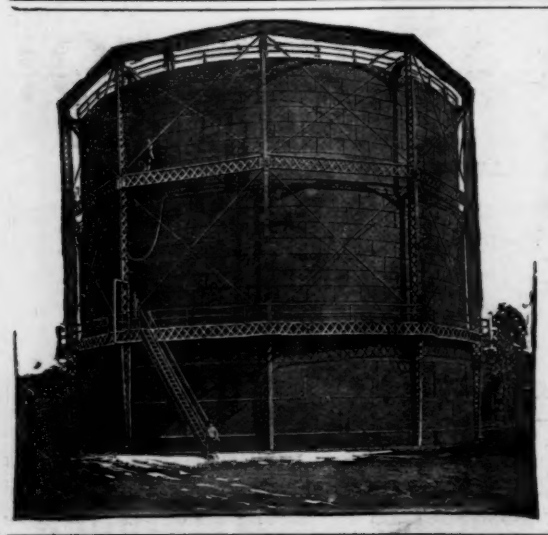
With Instructions for Care and Working of the Same.

By G. LIECKFELD, C.E.

Translated with Permission of the Author, by GEO. M. RICHMOND, M.E.

PRICE, $1.00.

A. M. CALLENDER & CO., 42 Pine Street, New York City.



DAVIS & FARNUM MFG. CO.,

WALTHAM, MASS.

Principal Office & Works, Waltham, Mass. Boston Office, R'm 18, Vulcan Bldg., 8 Oliver St.

Single, Double and Triple-Lift Gasholders of any Capacity. Tubular, Pipe and Sinuous Friction Condensers of all Sizes.

Steel Tanks for Gasholders, Iron Roof Frames and Floors, Purifying Boxes, Center Seal or Valve Connections, Bench Work, Reversible Lime Trays.

Self-Sealing and Pressed Steel Mouthpiece Lids.

Coke Barrows, Coal Wagons, and all Apparatus Requisite for a Complete Gas Works.

Also, Gas and Water Pipe, Flanged Pipe, Sugar House Work, and Special Castings of all Descriptions.

BAXTER & YOUNG,

CONTRACTING AND CONSULTING GAS ENGINEERS.

Examination and Values Ascertained of Artificial and Natural Gas Properties.

COMPLETE GAS WORKS ERECTED.

Artificial and Natural Gas Mains Furnished and Laid.

GAS PROPERTIES PURCHASED.

OFFICE: WAYNE COUNTY BANK BUILDING, Rooms 201 & 202. DETROIT, MICH.

A. E. BOARDMAN, C. E.,

Consulting and Contracting Engineer.

Particular attention given to Gas, Water and Electric Plants. Long and successful experience with the problem and practice of

Filtration for Public Water Supply.

Edison Building, 42 and 44 Broad St., NEW YORK CITY.

DAVID LEAVITT HOUGH,

Consulting Engineer

AND

CONTRACTOR,

PARK ROW BUILDING, N. Y.

Geo. Shepard Page's Sons.

GAS MACHINERY.

Correspondence Solicited.

180 Fulton Street, New York City.

Established 1876.

National Paint Works.

SPECIALISTS IN PAINTS FOR METAL SURFACES.

We Sell 60 Per Cent. of the Gas Companies of the U. S. their Paint. "Nuff said."

Great Northern Bldg., Chicago. Williamsport, Pa. 92 William Street New York City.

KERR MURRAY MANUFACTURING COMPANY,

Engineers and Manufacturers

APPARATUS FOR COAL GAS PLANTS,

SINGLE AND DOUBLE-LIFT GASHOLDERS AND STEEL TANKS,

Latest Improved

ROTARY EXHAUSTERS, P. & A. TAR EXTRACTORS, AMMONIA WASHERS,

CONDENSING, SCRUBBING AND PURIFYING APPARATUS

Street Specials and Valves.

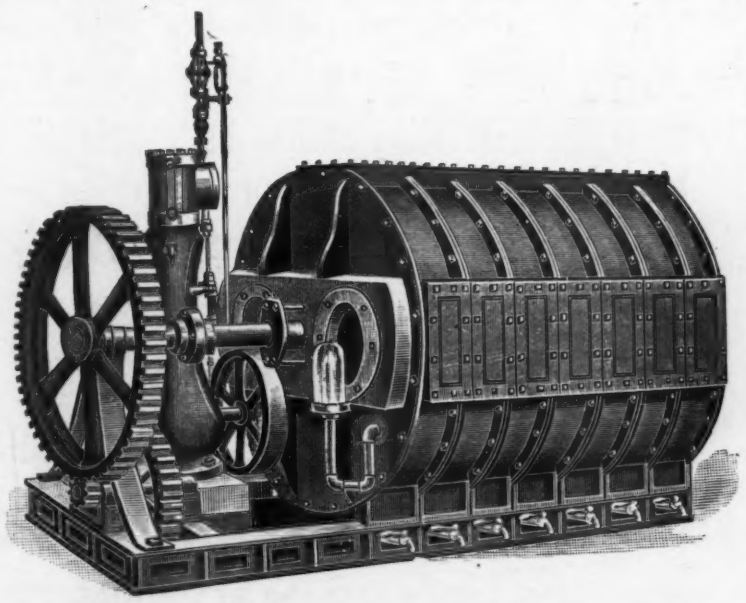
ADDRESS:

KERR MURRAY MANUFACTURING COMPANY, {FORT WAYNE, IND.

BARTLETT, HAYWARD & CO.

BALTIMORE, MD.

Designers and Builders of Gas Works.



Sole Lessees the Wilkinson Water Gas Process.

PATENT STANDARD WASHER-SCRUBBER.

The best apparatus for the extraction of all Ammonia and a large proportion of Carbonic Acid and Sulphureted Hydrogen. The Scrubber has been materially improved and is provided with patented Wooden Segmental Grids, instead of Metallic Discs, thus reducing the weight on shaft and power for operating same.

Coal and Water Gas Installations of the Most Modern and Complete Types.

BENCHES WITH INCLINED RETORTS.

System Stettiner Chamotte Fabrik, Actien Gesellschaft, of Stettin, Germany.

GASHOLDERS OF ALL SIZES.

General Western Agents, THE LLOYD CONSTRUCTION CO., of Detroit, Mich.

QUINTARD IRON WORKS,

N. F. PALMER,

Foot of 12th St. & East River, New York,

MANUFACTURERS OF

GAS APPARATUS.

Complete Works Erected.

FREDERICK W. FLOYD, Engineer.

ALEX. C. HUMPHREYS, M.E., M. Inst. C.E. ARTHUR G. GLASGOW, M. E., M. Inst. C.E.

HUMPHREYS & GLASGOW,

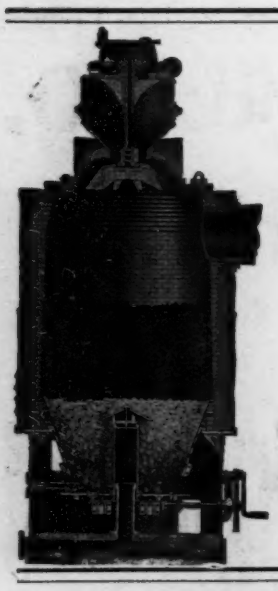
BANK OF COMMERCE BLDG., 31 Nassau Street, New York.

38 VICTORIA STREET, London S.W., England.

CONSULTING GAS AND ELECTRIC LIGHT ENGINEERS.

PROPERTIES PURCHASED.

COMPLETE EXAMINATIONS MADE.



R. D. WOOD & CO.,

400 CHESTNUT STREET, PHILADELPHIA,

—BUILDERS OF—

Gas Power Plants with Producers,

The best Producers for either Bituminous, Anthracite Coal or Lignite. Less labor required and less waste than in any other Producer. Send for Pamphlet. : : : :

CAST IRON PIPE.

HYDRAULIC TOOLS. HYDRAULIC OPERATING VALVES.

ISBELL-PORTER CO.,

ENGINEERS AND CONTRACTORS FOR THE

Construction and Extension of Gas Works.

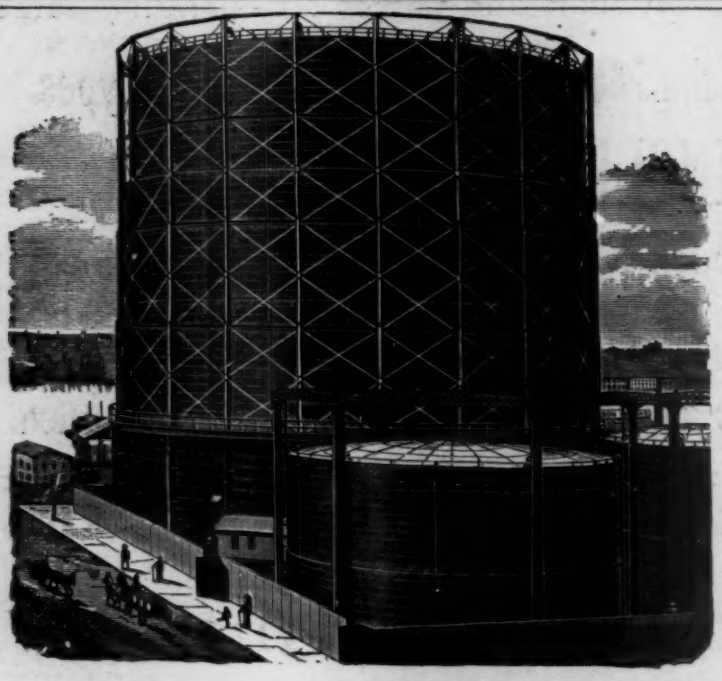
FOUNDERS AND MACHINISTS.

MANUFACTURERS OF

All Ironwork and Machinery Required in a Gas Plant.

Estimates, Drawings and Specifications furnished for the Alteration, Improvement, or Extension of Existing Works or the Construction of New Works.

OFFICE AND WORKS: Bridge and Ogden Streets, Newark, N. J.



The Continental Iron Works,

THOMAS F. ROWLAND, President.
WARREN R. HILL and CHAS. H. CORBETT, Vice-Presidents.
THOMAS F. ROWLAND, Jr., Secretary & Treasurer.

West and Calyer Sts. (Near 10th & 23d St. Ferries),
NEW YORK, Borough of Brooklyn.

BUILDERS OF

Gas Holders.

Single and Multiple Section Gas Holders a Specialty.

STEEL GAS HOLDER TANKS.

BENCH CASTINGS, RETORT LIDS.

Hydraulic Mains, Condensers, Scrubbers, Purifiers, Valves, Etc.

Self-Sealing Retort Mouthpieces & Lids

For Round, Oval, or "D" Retorts.

THE GAS ENGINEER'S LABORATORY HANDBOOK,

By JOHN HORNBY, F.I.C.

PRICE, - - - - - - $2.50.

A. M. CALLENDER & CO., No. 42 Pine Street, New York City.

THE STACEY MANUFACTURING CO.,

MANUFACTURERS OF

Gasholders, Steel Tanks,

AND ALL IRONWORK & MACHINERY REQUIRED IN A GAS PLANT.

ALSO THE ONLY AUTHORIZED MANUFACTURERS OF

The Chollar System of Gas Purification.

OFFICES:

No. 239 Mill Street, CINCINNATI, OHIO. 'Phone, West 690.

PLANS, SPECIFICATIONS AND ESTIMATES CHEERFULLY FURNISHED.

RITER-CONLEY MFG. CO.,

GASHOLDERS, with or without Steel Tanks.

Purifiers, Condensers, Scrubbers, Oil Tanks, Smoke Stacks

STEEL ROOFS and BUILDINGS.

PLATE AND STRUCTURAL WORK OF EVERY DESCRIPTION.

GENERAL OFFICE: Pittsburg, Pa. EASTERN OFFICE: 39-41 Cortlandt St., New York City.

WM. HENRY WHITE,

EDISON BUILDING, No. 44 BROAD STREET, - - - NEW YORK CITY,

ENGINEER AND CONTRACTOR FOR THE

ERECTION AND EXTENSION OF

GAS, WATER, AND ELECTRIC LIGHT WORKS.

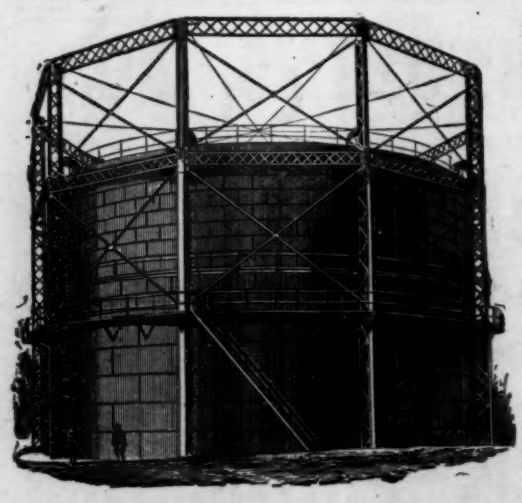
Correspondence with Gas Companies contemplating extending or improving their Plants respectfully invited.
Plans and Estimates Furnished.

1903 DIRECTORY 1903

OF AMERICAN GAS COMPANIES.

Price, - - - - - - - - $5.00.

A. M. CALLENDER & CO., - - No. 42 Pine Street, New York.



1842 ※ Deily & Fowler, ※ 1904

LAUREL IRON WORKS.

Office, No. 39 Laurel Street, Philadelphia, Pa.

BUILDERS OF

Gasholders

Single or Telescopic. With or Without Iron or Steel Tanks.

OIL TANKS, WATER TANKS, AND GENERAL WROUGHT IRON WORK.

The order for this Triple-Lift Holder and Steel Tank was received by the Logan Iron Works from the Union Gas Light Company, of East New York. The contract was completed and the Holder was in actual use in 90 days from receipt of order. Capacity of Holder, 500,000 Cu.Ft.

LOGAN IRON WORKS,

Brooklyn, N. Y.,

MANUFACTURERS OF

Single or Multiple-Lift

GASHOLDERS,

Complete, with Steel Tanks.

BENCHES, SCRUBBERS,

CONDENSERS,

PURIFIERS, IRON ROOFS,

AND ALL PARTS OF

GAS WORKS APPARATUS.

Contractors for Complete Works.

Gas Analyst's Manual,

By JAQUES ABADY, M. Inst. Mech. E.

(Incorporating F. W. Hartley's "Gas Analyst's Manual" and "Gas Measurement.")

Ninety-three Illustrations and Nine Folding Plates.

Bound in Handsome Half Leather. Price, - $6.50.

FOR SALE BY

A. M. CALLENDER & CO., - - 42 Pine Street, New York City.

Established 1854.

D. McDONALD & CO.,

MANUFACTURERS OF

WET AND DRY METERS, STATION METERS AND METER PROVERS.

ALSO MAKERS OF

THE GLOVER PREPAYMENT METER.

The amount of gas delivered for the coin can be instantly and positively changed without removing the meter or replacing any parts.

The gas registered agrees absolutely with the amount purchased by the coin.

WE HAVE MADE AND SOLD IN THE UNITED STATES

OVER 120,000 OF THESE METERS,

ALL OF WHICH ARE GIVING PERFECT SATISFACTION.

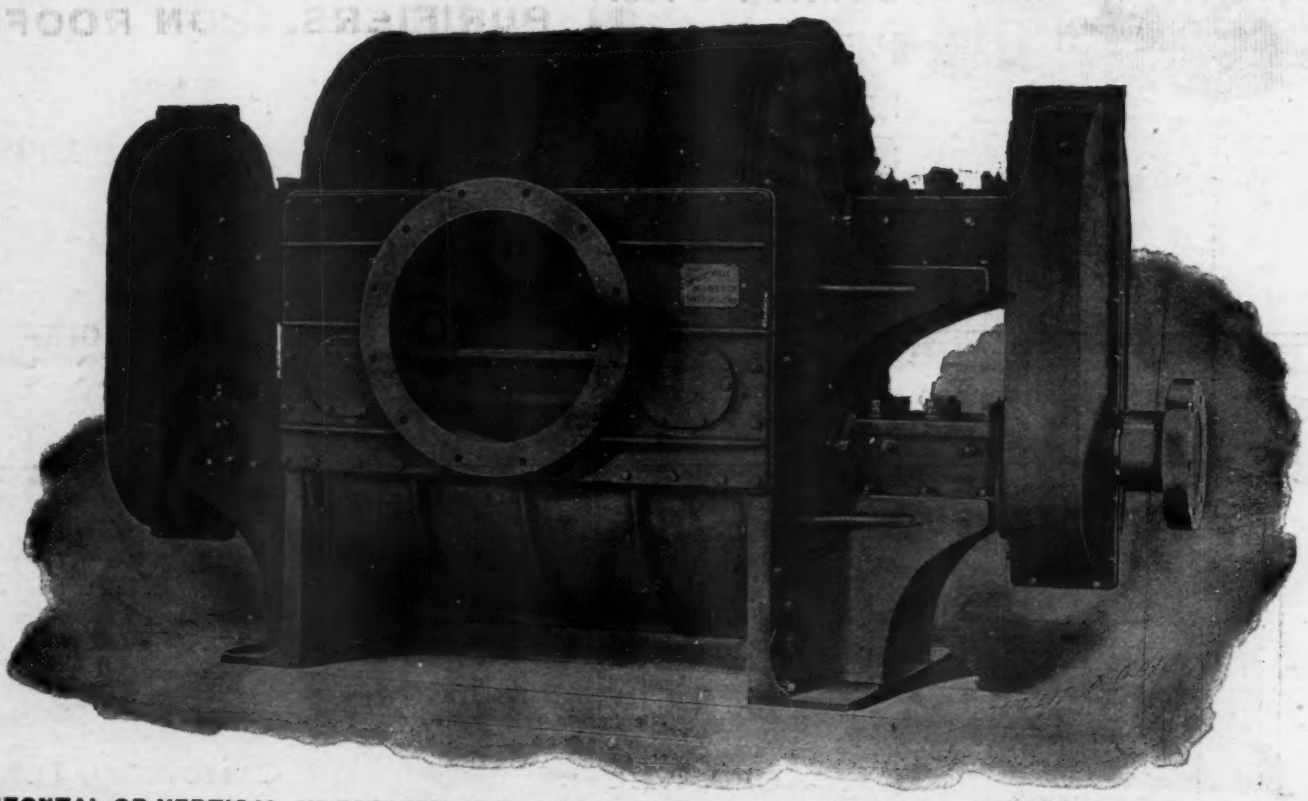
Correspondence Solicited.

561 West Forty-seventh Street, NEW YORK. | 51, 53 & 55 Lancaster Street, ALBANY, N. Y. | Jefferson and Monroe Streets, CHICAGO.

THE CONNERSVILLE BLOWER CO.,

MANUFACTURER OF

ROTARY POSITIVE PRESSURE GAS EXHAUSTERS, BLOWERS AND PUMPS.



HORIZONTAL OR VERTICAL, IN CAPACITY RANGING FROM 9,000 to 1,800,000 CU. FEET DISPLACEMENT PER HOUR.

CONNERSVILLE BLOWER CO., Connersville, Ind. EASTERN SALES OFFICE: 95-97 Liberty St., New York City.

NATHANIEL TUFTS METER CO.,

ESTABLISHED 1849.

8 MEDFORD STREET, BOSTON, MASS.

Consumers' Dry Gas Meters.
Station Meters of Any Capacity.

PREPAYMENT GAS METERS.

MARYLAND METER CO.,

BALTIMORE, North and Saratoga Streets. **CHICAGO, 88 to 92 Jackson Boulevard.**

CONSUMERS' AND STATION METERS, PRESSURE GAUGES, ETC.

SPECIAL ATTENTION GIVEN TO ALL REPAIR WORK.

"Have you Seen our Complaint Meter?"

USING KEYSTONE METERS

IS FRAUGHT WITH NO
DISAPPOINTMENTS.
PERFECTLY MADE.
PERFECT MEASUREMENT
GUARANTEED.

THE KEYSTONE METER COMPANY,

ROYERSFORD, PA.

DETROIT STOVE WORKS

"Largest Stove Plant in the World"

MANUFACTURES AND SELLS

DETROIT JEWEL GAS APPLIANCES

FOR COOKING and HEATING,

All about which is told in a fine and strictly "to-the-point" catalog, sent upon request to Gas Companies.

DETROIT, MICH. CHICAGO, ILLS.

AMERICAN METER COMPANY,

NEW YORK, PHILADELPHIA, CHICAGO
SAN FRANCISCO, ST. LOUIS.

PREPAYMENT METERS.

THEIR CONSTRUCTION IS SUCH THAT THEY MAY BE READILY READJUSTED WHEN THE SCALE OF GAS RATES IS CHANGED.

HELME & McILHENNY,

Established 1848. 1339 to 1349 Cherry Street, Philadelphia, Pa.

MANUFACTURERS OF

Wet and Dry Gas Meters, Station Meters, Provers, Gauges, Etc.

METERS REPAIRED

PREPAYMENT GAS METERS.

Our Own Patents Strong. Simple. PROMPT ATTENTION. CORRESPONDENCE SOLICITED

METRIC METAL COMPANY,

MAKERS OF

GAS METERS for NATURAL and ARTIFICIAL GAS.

Special Attention given to Repairing METERS of all Makes.

FACTORY AT ERIE, PA.

EXCERPTS FROM DECISIONS

—OF THE—

BOARD OF GAS COMMISSIONERS of the COMMONWEALTH OF MASSACHUSETTS.

MR. E. H. YORKE, NEW HAVEN, CONN., Dec. 1, 1898.

Dear Sir:—I am in receipt of a copy of "Excerpts from the Decisions of the Board of Gas Commissioners," which is a handy compilation in book form of extracts from the most recent decisions of the Gas Commission of Massachusetts.

I note that most of these extracts are broad and safe-guiding precepts, which apply with equal force to one Company as to another The 13 years' existence of the Board of Gas Commissioners with its unusual opportunities for acquiring information, have justly made it a high and safe authority in all matters pertaining to the management, obligations, and rights of Gas Companies. Your little book will serve as a valuable reference library in settling legal complications which often arise between a Gas Company and its customers.

Yours truly, (Signed) F. C. SHERMAN, Superintendent.

A 28-page Pamphlet containing the cream of this Board's decisions as to the proper management of Gas Companies.

Compiled by E. H. YORKE. Price $1.00 & Address

A. M. CALLENDER & CO., - No. 42 Pine Street, New York.

JOHN J. GRIFFIN & CO.,

1513 TO 1521 RACE STREET,

559 West 47th Street, NEW YORK.

PHILADELPHIA.

Jefferson and Monroe Streets, CHICAGO.

MANUFACTURERS OF

GAS METERS,

Station Meters and Experimental Apparatus of Every Description.

PROMPT ATTENTION GIVEN TO ALL REPAIRING.

OUR SPECIAL NATURAL GAS METER

Is the Best ever offered. Over 75,000 now in use.

The Positive Prepayment Meter.

Positive Advantages:

The Income is Quick and Sure.

IT IS

Better than C.O.D.,

As Gas is Paid for Before Delivery. : : :

There is Money in it ☞

For the gas man.

IT WILL GET NEW CUSTOMERS.

It will KEEP the ones you have.

Negative Advantages:

No "Deposit" is Necessary to Start Business with a new customer. : : :

NO CUSTOMERS ARE LOST on that account.

No Time Lost Making Out Bills.

No Money Lost on account of Unpaid Bills. :

No Disputes on Account of Bills.

THE PREPAYMENT SYSTEM IS PROFITABLE FOR THE GAS MAN AND PLEASANT FOR THE CONSUMER.

OVER 125,000 OF THE POSITIVE PREPAYMENT METERS ARE IN USE IN THE UNITED STATES.

SEND FOR OUR BOOKLET.